

DESIGN AND TESTING OF A BEHAVIORAL WEIGHT LOSS PROGRAM FOR AFRICAN  
AMERICAN WOMEN WHO ARE SEVERELY OBESE

Danielle Furci Braxton

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in  
partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department  
of Nutrition (Intervention and Policy) in the Gillings School of Global Public Health.

Chapel Hill  
2016

Approved by:

Alice Ammerman

Carmen Samuel-Hodge

Sadye Paez Errickson

Cheryl Giscombe

Tom Keyserling

Deborah Tate

© 2016  
Danielle Furci Braxton  
ALL RIGHTS RESERVED

## **ABSTRACT**

Danielle Furci Braxton: Design and Testing of a Behavioral Weight Loss Program for African American Women Who Are Severely Obese  
(Under the direction of Carmen Samuel-Hodge and Alice Ammerman)

The prevalence of severe obesity ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) in African American women tripled between 2000 (6%) and 2010 (18%). Behavioral weight loss (BWL) programs offer many benefits, yet we know very little about how to design effective programs for African American women with  $\text{BMIs} \geq 40 \text{ kg/m}^2$ . Thus, the overarching goal of this research is to understand the weight loss barriers of this specific group and then use this information to design and pilot-test a tailored BWL program.

To meet this goal, we conducted three inter-related research projects (two formative and one experimental). First, we coordinated 5 focus groups with African American women who met the BMI criteria for severe obesity ( $n = 20$ ). The primary purpose of the focus groups was to investigate the impact of two culturally-defined forms of stress (Role Overload and the Superwoman Role) on lifestyle behaviors relevant for weight loss.

Second, we used baseline data from a NC-based 5-year community-wide research project to compare diet and physical activity behaviors as well as the physical and mental well-being of African American women who are severely obese ( $n = 112$ ) with those who are overweight/moderately obese ( $\text{BMI } 25.0 - 39.9 \text{ kg/m}^2$ ,  $n = 185$ ). We used this information to develop a tailored BWL program that incorporated additional content that focused on stress-reduction ("Standard Treatment + Stress Reduction, ST+SR). Using a 2-arm RCT we compared

the ST+SR program to a standard BWL program (“Standard Treatment”, ST). Our primary outcome was difference in weight change (pre-post) between the two groups at 6-months follow-up compared using a 2-sample t-test and intent-to-treat.

Forty-six (n= 46) women were randomly assigned to the two treatments. Findings indicated that the pre-post weight changes were not significantly different between groups; -0.31% vs. -2.1% (p = 0.17). Unfortunately, participant attrition was high (n = 19, 41%). More research needs to be devoted to understanding how to improve BWL program retention and program adherence among African American women who are severely obese. The most critical questions relate to understanding which cultural and psychosocial variables are most relevant for tailoring BWL programs for this specific population.



## **ACKNOWLEDGEMENTS**

First, I would like to express my sincere and heart-felt gratitude to the members of my dissertation committee: Dr. Alice Ammerman (chair), Dr. Carmen Samuel-Hodge (co-chair), Dr. Sadye Paez Errickson, Dr. Cheryl Giscombe, Dr. Thomas Keyserling and Dr. Deborah Tate. Thank you for your guidance and encouragement throughout this process; it was truly an honor having each of you on my committee. To my academic advisor and committee chair, Dr. Ammerman, thank you for taking a chance on me and for your sustained faith in me through all of the ups and downs of this journey. To my research advisor and mentor, Dr. Samuel-Hodge, thank you for the sacrifices you made on my behalf. I am forever grateful for your wisdom, encouragement, patience and most of all, your friendship.

I would like to recognize the three agencies who funded my dissertation research; The Center for the Study of the American South at UNC, The Academy of Nutrition and Dietetics Foundation and the UNC University Research Council. Thank you for seeing value and merit in my proposals and for entrusting me with this opportunity. Thank you to all of my research staff and volunteers including Shamera Robinson, Elizabeth Nixon, Gwendolyn Davis and most of all, our study interventionist, Katie Lockamy. I maintain to this day that our paths crossing can be explained by nothing short of divine intervention. Thank you for your friendship and for your incredible patience and understanding. I would also like to extend a sincere thanks to all of the women who participated in this research study and especially those who were willing to share their experiences with me and who provided the encouragement that, at times, I very much needed and appreciated.

To my graduate school peers—my fellow wayward wanderers—especially Linden Thayer, Loneke Blackman, Harlyn Skinner and Tosha Woods. I am grateful to have shared these years with such a witty, intelligent, kind, and strong group of women. Last, but unquestionably not least, I would like to thank all of my friends and family members for their tremendous support, even when they didn't fully understand the topic of my research or the reasons I chose to pursue this sometimes seemingly irrational career path. Most of all, I would like to thank my husband, Clay, for his unwaivering love and support for which I am deeply and forever grateful.

## TABLE OF CONTENTS

LIST OF TABLES .....	xii
LIST OF FIGURES .....	xiii
LIST OF ABBREVIATIONS.....	xiv
CHAPTER I: INTRODUCTION.....	1
I.A. Overview .....	1
I.B. Formative Aims and Rationale .....	1
Formative Aim 1 .....	1
Formative Aim 2 .....	2
Formative Aim 3 .....	3
I.C. Experimental Aims and Hypotheses.....	3
Experimental Aim 1 .....	3
Experimental Aim 2 .....	4
Experimental Aim 3 .....	4
Experimental Aim 4 .....	4
Experimental Aim 5 .....	4
Experimental Aim 6 .....	5
Experimental Aim 7 .....	5
CHAPTER II: A CONCEPTUAL MODEL DEPICTING A HYPOTHESIS FOR THE DEVELOPMENT OF SEVERE OBESITY IN AFRICAN AMERICAN WOMEN.....	6
II.A. Introduction .....	6
II.B The Stress-Obesity Relationship .....	8

Behavioral and Biological Components .....	9
II.C. Role Overload.....	11
Construct Overview .....	11
“The Multiple Caregiver Role” .....	11
Insufficient Social Support .....	13
Economic Strain.....	14
II.D. “The Superwoman Role” .....	15
An Obligation to Manifest Strength.....	16
An Obligation to Suppress Emotions.....	17
Resistance to Being Vulnerable or Dependent .....	17
II.E. Stress Coping Strategies and Body Weight.....	17
Low Levels of Physical Activity.....	18
Compulsatory Eating Behaviors and Disordered Eating Patterns .....	19
Increased Caloric Intake Primarily Through “Junk Foods” .....	23
II.F Other Contributors .....	25
Cultural Factors.....	25
Physical Limitations.....	27
Genetic Makeup .....	28
II.G Summary .....	29
CHAPTER III: LITERATURE REVIEW .....	34
III.A. Obesity Defined .....	34
III.B. Contributors to Obesity .....	34
III.C. Obesity, Disease Risk and Public Health Consequences .....	35
III.D. Rationale For Severe Obesity as a Public Health Priority .....	36
III.E. Surgery as a Treatment for Severe Obesity .....	37

III.F. Pharmacotherapy as a Treatment for Severe Obesity.....	37
III.G. BWL Programs as a Treatment for Severe Obesity.....	38
BWL Programs   Diet.....	39
BWL Programs   Physical Activity.....	41
BWL Programs   Behavior Therapy .....	41
BWL Programs   Examples.....	42
III.H. Tailoring BWL Programs .....	43
III.I. Efficacy of BWL Programs for African American Women.....	44
III.J. Efficacy of BWL Programs for Severely Obese Populations .....	46
III.K. Summary.....	47
CHAPTER IV: A MIXED METHODS INVESTIGATION OF CONTEXTUAL STRESS EXPERIENCES AND ASSOCIATED COPING BEHAVIORS IN AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE .....	54
IV.A. Overview.....	54
IV.B. Introduction.....	55
IV.C. Methods.....	58
Participant Recruitment .....	58
Questionnaire .....	59
Focus Groups .....	62
Data Analysis .....	63
IV.D. Results.....	64
Participants.....	64
Questionnaires.....	64
Focus Groups .....	66
IV.E. Discussion and Conclusions.....	69

Strengths and Weaknesses .....	73
Implications for Future Research and Practice .....	73
CHAPTER V: COMPARING PSYCHOSOCIAL CHARACTERISTICS AND LIFESTYLE BEHAVIORS OF AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE TO AFRICAN AMERICAN WOMEN WHO ARE OVERWEIGHT/OBESE: A CROSS-SECTIONAL STUDY .....	78
V.A. Overview .....	78
V.B. Introduction .....	79
V.C. Methods .....	81
V.D. Results .....	84
V.E. Discussion and Conclusions .....	85
CHAPTER VI: THE S.T.R.E.N.G.T.H. (SHAPELY SISTERS TARGETING REALISTIC EXERCISE & NUTRITION GOALS THROUGH HEALTHY HABITS) STUDY: RESULTS FROM A RANDOMIZED CONTROLLED TRIAL TO EVALUATE THE FEASIBILITY OF A BEHAVIORAL WEIGHT LOSS PROGRAM FOR AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE .....	95
VI.A. Overview .....	95
VI.B. Introduction .....	96
VI.C. Methods .....	99
VI.D. Results .....	109
VI.E. Discussion and Conclusions .....	112
CHAPTER VII: SUMMARY OF FINDINGS AND RECOMMENDATIONS FOR FUTURE RESEARCH .....	125
VII.A. Summary of Findings .....	125
Aim One .....	126
Aim Two .....	128
Aim Three .....	130
VII.B. Implications of Findings for Practice .....	131

VII.C. Recommendations for Future Research.....	135
APPENDIX I: STRENGTH STUDY BRANDING .....	138
APPENDIX II: STRENGTH STUDY WEBSITE SCREENSHOTS .....	139
APPENDIX III: STRENGTH STUDY TELEVISION ADVERTISING SCREENSHOTS .....	140
APPENDIX IV: NETWORK RESEARCH INFORMATION FROM TELEVISION ADVERTISING COMPANY .....	144
APPENDIX V: STRENGTH STUDY LETTER AND INCENTIVE SENT TO PARTICIPANTS REGARDING FOLLOW-UP DATA COLLECTION .....	145
APPENDIX VI: STRENGTH STUDY ONLINE BASELINE QUESTIONNAIRE (A SELECTION OF 3 SCREENSHOTS).....	148
APPENDIX VII: MEASUREMENT TOOLS USED IN THE QUESTIONNAIRES DISCUSSED IN CHAPTERS IV AND VI .....	151
REFERENCES .....	169

## LIST OF TABLES

Table 1: Top food categories that contribute to caloric intake, all Americans vs. African Americans only .....	33
Table 2: Social-Ecological Model (SEM) levels/definitions and examples related to energy balance .....	49
Table 3: A Comparison of DPP and Look AHEAD with the AHH/ACC/TOS guidelines and SCT key constructs .....	51
Table 4: Selected SCT constructs with definitions and intervention implications .....	52
Table 5: A selection of characteristics of three BWL programs designed for severely obese populations.....	53
Table 6: Focus group participant demographics.....	75
Table 7: Focus group participant psychosocial variable scores.....	76
Table 8: Pearson product moment correlations results for focus group participants.....	77
Table 9: African American female HHL participant demographics.....	90
Table 10: DRA scores for African American female HHL participants .....	91
Table 11: Physical Composite, Mental Composite and Social Support Scores for African American female HHL participants .....	92
Table 12: Pedometer measured steps per day for African American female HHL participants .....	93
Table 13: Physical activity scores for African American female HHL participants .....	94
Table 14: Session topics by group for the STRENGTH study .....	117
Table 15: Baseline STRENGTH study participant characteristics .....	120
Table 16: Change in primary outcome (weight) from baseline to follow-up by treatment group for STRENGTH study participants.....	122
Table 17: Change in secondary outcomes from baseline to follow-up by treatment group for STRENGTH study participants.....	123



## LIST OF FIGURES

Figure 1: A conceptual model depicting a hypothesis for the development of severe obesity in African American women .....	30
Figure 2: Factors influencing the stress-obesity relationship based on previous models by Lazarus et al. (1984) and McEwen et al. (1993).....	31
Figure 3: Mediators of the relationship between “Trauma Exposure/Distress” and “Binge Eating” among African American women based on the findings presented in Harrington et al. (2010) .....	32
Figure 4: Social-Ecological Model of Health .....	48
Figure 5: Percentage increase in BMI categories since 1986 from Sturm et al. (2006) <i>Reprinted with permission.</i> ....	50
Figure 6: Flow of participants through randomized control trial (follow-up at 6 months).....	119

## LIST OF ABBREVIATIONS

AHA/ACC/TOS	American Heart Association/American College of Cardiology /The Obesity Society
ANOVA	Analysis of Variance
BWL	Behavioral Weight Loss (Program)
BED	Binge Eating Disorder
BES	Binge Eating Scale
BMI	Body Mass Index (kg/m <sup>2</sup> )
CES-DS	Center for Epidemiologic Studies Depression Scale
DPP	Diabetes Prevention Program
DASH	Dietary Approaches to Stop Hypertension
DRA	Dietary Risk Assessment
ST+SR	Standard Treatment + Stress Reduction
GRSS	Gender-Related Stress Scale
HHL	Heart Healthy Lenoir (Project)
ITT	Intention To Treat
MOS-SS	Medical Outcomes Study Social Support (Scale)
MCS	Mental Composite Score
MLR	Multiple Linear Regression
MCR	Multiple Caregiver Role
MCMI	Multiple Caregiving Measurement Instrument
RESIDE	<b>RESID</b> ential Environment (physical activity questionnaire)
NHANES	National Health and Nutrition Examination Survey
NES	Night Eating Syndrome
NEQ	Night Eating Questionnaire

PSQ	Perceived Stress Questionnaire
PCS	Physical Composite Score
RO	Role Overload
SCT	Social Cognitive Theory
SD	Standard Deviation
SS-D	(Sallis) Social Support for Diet
SS-E	(Sallis) Social Support for Exercise
ST	Standard Treatment
SRBWS	Stereotypic Roles for Black Women Scale
SR	Superwoman Role
UNC-CH	The University of North Carolina at Chapel Hill
UNC-HPDP	The University of North Carolina at Chapel Hill, Center for Health Promotion and Disease Prevention
UNC-IRB	The University of North Carolina Institutional Review Board
UFTCS	Using Food to Cope Scale
WWP	Weight Wise Program

## CHAPTER I: INTRODUCTION

### I.A. Overview

The prevalence of severe obesity—defined as having a Body Mass Index (BMI)  $\geq 40$ —in African American women *doubled* between 1990 (3%) and the year 2000 (6%) and *tripled* between 2000 and 2010 (18%). Despite this trend, there are no published studies—*qualitative, quantitative, experimental or otherwise*—that specifically seek to investigate the weight loss needs of African American women who are severely obese. While bariatric surgery has shown to be an effective treatment for severe obesity, it is not sufficient to meet the needs of a growing and diverse severely obese population. More specifically, disparities in uptake of this modality are seen among minorities, notably African Americans. Behavioral weight loss (BWL) programs offer many benefits, yet, we know very little about how to design effective treatments for this population. Thus, the overarching goal of this research is to understand the weight loss barriers of African American women who are severely obese and then design and evaluate the efficacy of a BWL program tailored to meet these specific needs.

### I.B. Formative Aims and Rationale

#### *Formative Aim 1*

Conduct focus groups with African American women who are severely obese in order to:

- (1) explore barriers to engaging in healthy lifestyle behaviors with a focus on the relevance of the chronic stressors Role Overload (RO) and the Superwoman Role (SR);
- (2) elicit opinions on

intervention content and characteristics (e.g. location, timing, setting, preferences for qualities in a program facilitator, etc.).

#### RATIONALE

The literature is clear that African American women experience high levels of stress and that the types of stress they experience are unique to their gender and race. Through both physiological and behavioral mechanisms, stress has been shown to have a significant and profoundly negative impact on their health, including increased body weight. However, very little is known about how to help African American women reduce stress in a manner that is both clinically significant and long lasting or if reducing stress levels can assist in weight loss. In addition, little is known about how to design effective BWL programs for African American women in large part because African American women are frequently underrepresented in BWL intervention research and are at higher risk of attrition once enrolled. We know even less about designing BWL programs for African American women who are also severely obese.

#### *Formative Aim 2*

Using baseline data collected from a subsample of participants in the Heart Healthy Lenoir (HHL) Intervention studies examine differences between moderately obese (BMI 30 – 39.9 kg/m<sup>2</sup>; n = 195) and severely obese (n = 112) African American women with regards to demographic characteristics, psychosocial variables (depression, social support, etc.) and dietary/physical activity behaviors.

#### RATIONALE

Studies with predominately Caucasian samples have shown that individuals who are severely obese report significantly *lower* levels of social support and self-esteem and significantly *higher* levels of depression and financial stress compared to their moderately obese counterparts.

Determining whether severely obese African American experience these differences or others, will inform the focus areas of the intervention. Diet and physical activity modifications are central components of BWL programs. However, few if any details are published about the dietary and physical activity habits of individuals who are severely obese and individuals who are severely obese within certain racial/ethnic groups. As such, there is little information on baseline behaviors within this target population.

### *Formative Aim 3*

The findings from Formative Aims 1 and 2 described above will be used to modify components of the experimental aims and/or improve details of the actual intervention. Given the paucity of research in this specific population it is possible that refinements may be needed in the following areas: recruitment strategies or materials, types of measures that are collected (specifically, secondary outcomes such as psychosocial variables, dietary or physical activity) and/or curricula content (topics to emphasize, add or remove, etc.).

## **I.C. Experimental Aims and Hypotheses**

### *Experimental Aim 1*

Using a 2-arm randomized controlled trial, compare the efficacy of a standard 6month tailored BWL program—“Standard Treatment”—compared to a stress-focused 6-month tailored BWL program—“Standard Treatment + Stress Reduction”—on weight change in African American women who are severely obese.

### **HYPOTHESIS**

African American women who are severely obese taking part in the Standard Treatment + Stress Reduction (ST+SR) group will lose significantly more weight than women in Standard Treatment (ST) group at the end of 6 months.

### *Experimental Aim 2*

Determine the effect of an ST+SR vs. ST on physical mobility.

#### HYPOTHESIS

Timed-Up-and-Go (TUG) Test scores for mobility for African American women who are severely obese in the ST+SR group will be significantly **lower** than TUG Test scores for African American women who are severely obese in the ST group at the end of 6 months.

### *Experimental Aim 3*

Determine the effect of an ST+SR vs. ST on minutes of physical activity per week.

#### HYPOTHESIS

Total number of self-report minutes of physical activity for African American women who are severely obese in the ST+SR group will be significantly **higher** than total number of self-report minutes of physical activity for African American women who are severely obese in the ST group at the end of 6 months.

### *Experimental Aim 4*

Determine the effect of an ST+SR vs. ST on perceived stress levels.

#### HYPOTHESIS

Perceived stress levels as measured by in the ST+SR group will be significantly **lower** than perceived stress levels in the ST group at the end of 6 months.

### *Experimental Aim 5*

Determine the effect of an ST+SR vs. ST on unhealthy stress coping behaviors.

## HYPOTHESIS

Scores on the Using Food to Cope Scale (UFTCS) for African American women who are severely obese in the ST+SR group will be significantly **lower** than scores on the UFTCS for African American women who are severely obese in the ST group at the end of 6 months.

### *Experimental Aim 6*

Determine the effect of an ST+SR vs. ST on dietary patterns.

## HYPOTHESIS

Scores on the Dietary Risk Assessment (DRA) survey for African American women who are severely obese in the ST+SR group will be significantly **higher** than scores on the DRA survey for African American women who are severely obese in the ST group at the end of 6 months.

### *Experimental Aim 7*

Determine the effect of an ST+SR vs. ST on social support for diet and exercise.

## HYPOTHESIS

Scores on the SS-D and SS-E for African American women who are severely obese in the ST+SR group will be significantly **higher** than scores on the SS-D and SS-E for African American women who are severely obese in the ST group at the end of 6 months.



## CHAPTER II: A CONCEPTUAL MODEL DEPICTING A HYPOTHESIS FOR THE DEVELOPMENT OF SEVERE OBESITY IN AFRICAN AMERICAN WOMEN

### II.A. Introduction

The prevalence of severe obesity—Body Mass Index (BMI)  $\geq 40$ —in African American women *doubled* between 1990 (3%) and the year 2000 (6%) and *tripled* between 2000 and 2010 (18%).<sup>1,2</sup> Despite this trend, there are no published studies—*qualitative, quantitative, experimental or otherwise*—that specifically seek to investigate the weight loss needs of African American women who are severely obese. This is concerning because challenges related to weight loss can be specific to one or more of many individual characteristics including race, gender and BMI. As previously discussed, this overarching knowledge gap defined the general purpose of this research, which was to understand the weight loss barriers of African American women who are severely obese and then design and evaluate the efficacy of behavioral weight loss (BWL) program tailored to meet these specific needs.

An extensive literature review was conducted using the search terms: weight loss, African American, women, severe obesity, morbid obesity and class III. The information gathered from the review was then analyzed and used to inform the development of a conceptual model of the problem of severe obesity in African American women. Conceptual models are tools used by public health practitioners and researchers alike to aid in the understanding of complex public health problems and in the development of programs to treat these problems. In their 1991 foundational article, Earp and Ennett define conceptual models as:

*A diagram of proposed causal linkages among a set of concepts (aka factors or variables, abstract terms able to be empirically observed or measured) believed to be related to a particular public health problem.*

The flexibility of conceptual models is a characteristic that greatly enhances their usefulness.

They can be informed by one or more formal theories and/or less formally defined empirical observations.

Because there is very little published data on the specific population of African American women who are severely obese, two separate but related literature bases were used when developing the conceptual model and included the following: (1) studies focusing on BWL programs for African American women and (2) studies focusing on BWL programs for individuals who are severely obese. It should be noted that both bodies of literature are relatively small and a good proportion of the studies are qualitative or cross-sectional in design. For example, several cross-sectional quantitative studies have been conducted mainly investigating demographic, psychosocial and sometimes physiological differences between individuals who are severely obese ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) and their moderately obese ( $\text{BMI} 30 - 39.9 \text{ kg/m}^2$ ) and/or overweight ( $\text{BMI} 25 - 29.9 \text{ kg/m}^2$ ) counterparts. In the case of African Americans, studies tend to look at differences in many of these same factors by race/ethnicity.

With respect to interventions, with the exception of a few large, well-funded trials<sup>3-5</sup> most of the published weight loss studies focusing on either African Americans or individuals who are severely obese are small,<sup>6-11</sup> underfunded (which often impairs measurement) and/or use less rigorous research designs such as one group pre-post, retrospective cohorts or no randomization.<sup>9-19</sup> Furthermore, many of the lifestyle weight loss interventions targeting individuals who are severely obese were conducted abroad (Italy,<sup>20,21</sup> Denmark,<sup>22</sup> Germany,<sup>23,24</sup> Sweden,<sup>25</sup> Finland,<sup>26</sup> Norway,<sup>27</sup> Australia,<sup>28</sup> Portugal,<sup>29</sup> United Kingdom<sup>30</sup> and Mexico<sup>23</sup>), which limits the generalizability of the findings to US populations.

For African American women, the paucity of high quality weight loss studies is due in large part to the fact they are consistently underrepresented in research in proportion to their representation in the general population.<sup>31,32</sup> The reasons for this under-representation are multifaceted and include: distrust of the medical/scientific community, lack of knowledge concerning clinical trials, cultural barriers and the failure of researchers to actively recruit minority populations.<sup>31-33</sup> To exacerbate these challenges, attrition rates for African American women and women with higher bmi in weight management trials have sometimes been found to be significantly higher than their Caucasian counterparts, which further exacerbates the ability to draw conclusions concerning the efficacy of a particular approach.<sup>32</sup>

Thus, although there is relatively little high quality data on which to develop a framework for a weight loss intervention for this population, the conceptual model presented in Figure 1 was built on evidence obtained via a careful view of the literature. Only the most salient, consistent and significant findings were included in the model.

## **II.B The Stress-Obesity Relationship**

One thing that is clear from the literature on African Americans and obesity is the deleterious effect of stress on maintaining a healthy body weight. One of the most robust, salient and well-studied themes in the African American weight loss literature is the role of “stress”, which is the central theme of this conceptual model. There are several recent publications that attest to both the high amount and unique sources of stress in the lives of African Americans, especially African American women.<sup>34</sup> Even compared to African American men, African American women report higher levels of distress including experiences with sadness, restlessness and that “everything is an effort”.<sup>35</sup> A qualitative study by Walcott-McQuigg et al. (2010) reports that, compared to Caucasian women, African American women are more likely to report lower

levels of coworker support, heavier workloads and more trouble with their boss and subordinates.<sup>36</sup> Mullings et al. (1984) describe how African American women reported the lowest level of emotional well-being across sex and race with 63% reporting moderate to severe levels of stress.<sup>37</sup> Ironically, despite the saliency of this theme in the qualitative and cross-sectional literature, while many weight loss interventions address stress management to some degree (e.g. through problem solving techniques, etc.) only one lifestyle intervention among African American women has been conducted with a central focus on stress management;<sup>6</sup> the details will be discussed later.

High levels of stress have also been noted within the severely obese population. In a cross-sectional study by Wadden et al. (2006) even compared to their moderately obese counterparts (e.g. those with a BMI ranging from 30.0 – 39.9 kg/m<sup>2</sup>), individuals who are severely obese were significantly more likely to report contending with health-related stressors (60% for Class III vs. 21.6% for Class I & II,  $p < 0.01$ ) and legal/financial stress (30.9% for Class III vs. 10.2% for Class I & II).<sup>5</sup> Although there is little to no information on whether stress levels vary by weight status among African American women, a study by James et al. (2012) of 413 African American women found that obese women were significantly more likely to report they desired information on how to manage stress ( $p < 0.01$ ).<sup>38</sup>

### *Behavioral and Biological Components*

Generally speaking, many authors define stress as a lack of resources or a state where the demands threaten to outstrip resources.<sup>39</sup> In their widely cited book “Stress, Appraisal and Coping” Lazarus and Folkman define stress as a multi-component event. The “antecedent” is the actual stressor, which is broadly defined. Antecedents can be chronic or acute and can vary in intensity; they are also subjective to the person experiencing the stressful event.<sup>40</sup> Thus, many

scientists stress the importance of understanding the individual's perception of the stress instead of the objective experience.<sup>41,42</sup> The second part of the stress event is the way that an individual responds to the stressor, which can be broken down into two different but highly related components: behavioral responses and biological responses.

Behavioral responses to stress have been broken down and defined in many different ways but, in general, they fall into two broad categories; adaptive or maladaptive.<sup>40,43,44</sup> Adaptive coping behaviors tend to reduce the impact of the stressor whereas maladaptive coping behaviors either have no impact or, in some cases, worsen the impact of the stressor. The role of specific adaptive and maladaptive behavioral responses used by African American women to cope with stress will be discussed in greater detail later.

An individual's biological response to stress is dependent upon several factors including: their perception of the stressor,<sup>41</sup> genetics<sup>45</sup> and, of course, the coping strategy they use to confront the stressor.<sup>46,47</sup> However, generally speaking, the central sympathetic nervous system is responsible for the major stress response pathway in humans. Included in this pathway is the hypothalamic pituitary adrenal axis, which is responsible for the release of cortisol. Cortisol plays a role in energy regulation by releasing energy through gluconeogenesis and lipolysis. It also activates lipoprotein lipase, which, in turn, regulates lipid accumulation in adipocytes increasing fat retention, particularly in the abdomen.<sup>48-51</sup> See Figure 2 for conceptual model of the stress-obesity relationship based on theories described above.

Quality studies in humans in "real world" settings investigating the links between stress and weight are rare due in large part to the difficulties in measuring stress and food intake. However, in lab animals, several studies have shown a link between exposure to stress (both acute and chronic) and weight gain (primarily through increased eating behavior).<sup>39</sup> Laboratory

studies done with women investigating the role of cortisol release in the stress/body weight relationship found positive and statistically significant relationships between stressful experiences or perceived stress with cortisol release and low waisttohip ratios.<sup>51,52</sup>

## **II.C. Role Overload**

### *Construct Overview*

Although African American women face many significant and unique stressors, the concept of Role Overload (RO) is especially prominent. In their 1985 publication Barnett et al. coined the term, which they define as having so many role demands or obligations that the individual feels unable to perform them all adequately.<sup>53</sup> Thus, in accordance with this definition, RO is a combination of two important and contrasting states: high demands and low resources. Many historical, social, cultural and socioeconomic factors that are unique to African American women contribute to the high risk of experiencing RO related stress. Included among them are (1) the embodiment of the multiple caregiver role (MCR) (high demands), (2) low levels of social support (low resources) and (3) low socioeconomic status (low resources) as depicted in the conceptual model (Figure 1).

### *“The Multiple Caregiver Role”*

In a qualitative study with southern, mostly rural African American women with diabetes, Samuel-Hodge et al. (2000) coined the term “Multiple Caregiver Role” to “describe the feeling of responsibility for providing emotional and/or tangible aid to extended family members and friends”.<sup>54</sup> Women in the focus groups (n=70) described how the MCR was a significant source of stress in their lives and often left them physically and mentally tired, which, in turn, impacted their ability to successfully manage their diabetes. Further supporting the importance of this role as a source of stress in the lives of these women is the fact that women who described themselves

as retired and/or living alone reported little to no stress whereas women who were working or caring for other family members mentioned experiencing many stressful situations. More specifically, the caregivers cited that the stress of the MCR was attributable to lack of empathy from friends and family, which resulted in a lack of tangible support in performing physical tasks.

These findings are similar to those of several other studies. Two cross-sectional quantitative studies and one qualitative study found that women (and in two studies, African American women specifically) rated responsibilities to friends and family as a top source of stress and a barrier to weight loss.<sup>55-57</sup> A mailed questionnaire to 143 mothers of preschool-aged children (race/ethnicity not reported) found that the number of children was uniquely related to RO ( $B = 0.70$ ,  $p < 0.01$ ) such that as the number of children increased so did RO.<sup>42</sup>

There are many reasons why African American women are subject to embodying the MCR. A number of theorists suggest that for women, in general, the central or organizing principle of their lives is their “relatedness to and mutual support and empathy with others”.<sup>42</sup> For African Americans specifically, some women report that assuming the MCR meant having the ability to wear many hats (e.g. wife, mother, second mother, cook, household manager, worker outside the home, chauffeur, church member, caregiver and confidante), which gave them a sense of purpose, independence and control and, most importantly, confirmed their identification as strong Black women.<sup>56,58</sup> However, African American women do not always openly embrace the MCR, which is not surprising given that is a common source of stress. Sometimes women embody this role out of a feeling of obligation or as a result of having difficulties in saying “no”. Women have also described their fears that if they focus too much on

themselves (as opposed to serving the needs of others) they will be viewed as “weak” by other African American women.<sup>59</sup>

### *Insufficient Social Support*

There is a broad and relatively robust literature supporting the important and positive role that social support can play in health behaviors among African Americans including diet and physical activity<sup>60-63</sup>, which are key components of a lifestyle based weight loss program. Like “stress”, social support is a construct that is multifaceted in that it can be physical/tangible, emotional or informational. In addition, the efficacy of social support also varies by the health behavior in question, the characteristics and relationship of the person providing the support and also by how the supportive act is perceived by the recipient.

Although some theories have been proposed, there still seems to lack consensus on the theoretical mechanisms through which social support and social relationships are able to promote healthy behaviors.<sup>64,65</sup> As a result, despite the evidence in favor of social support listed above, the heterogeneity of the construct and also the tools used to measure it have led to inconclusive findings for several health behaviors, including weight loss,<sup>66,67</sup> diabetes management,<sup>68</sup> and physical activity.<sup>69</sup> What is important to remember about social support is that in order for it to be effective: (1) the type of support provided must match the needs of the recipient<sup>65,70</sup>, (2) the recipient’s relationship to the support provider (as well as characteristics of the provider) impacts how a supportive act is perceived<sup>70</sup> and (3) the perception of the supportive act by the recipient is what determines its efficacy in changing behavior.<sup>64,71</sup>

African American women frequently report low levels of social support as a barrier to engaging in health behaviors.<sup>58,72,73</sup> In their 2012 study, Samuel-Hodge et al. present findings that reflect how support may not match the needs of the recipient. A series of focus groups with



African American women and their family members was conducted, and family members reported that although they felt a sense of responsibility to “monitor the self-management behaviors of their family members living with diabetes” they had difficulty identifying their specific needs. Family members would sometimes try to support their family member with diabetes by reminding them to engage or not engage in certain behaviors, which was viewed as “nagging”. Or, they would reminded them of the adverse outcomes of uncontrolled diabetes that the women felt was “cruel”.<sup>74</sup>

The relationship between the support provider and the recipient are also important to consider. Family members of African American women with diabetes reported conflict between their roles as supporter and that of husband, wife, mother, daughter etc.<sup>74</sup> Characteristics of the supporter are also important. Thoits et al. (1986) argue that in order for support to be effective, supporters must be able to empathize and/or be “socially similar” with the individual to whom they are providing the support.<sup>70</sup> When there is a disjoint, support may be perceived as being “controlling” or “demanding” and perhaps more motivated by the supporters self-interests than that of the support recipient. It is also important to note that African American women are sometimes reluctant to accept support from others. The reasons for this are primarily cultural and will be discussed in more detail in a later section of this manuscript.

### *Economic Strain*

Being African American and/or being severely obese have both been associated with low socioeconomic status. The many socioeconomic challenges of African American women including food insufficiency, stressful neighborhood conditions such as crime, drugs, access to healthcare, etc. are well documented.<sup>75,76</sup> as has the role that lack of access to resources plays in engaging in healthy lifestyle behaviors.<sup>57</sup> Many argue that lack of resources is in large part

attributable to a history of “institutional racism”, which has resulted in geographic areas characterized by increased population density, poor housing quality, poverty, lack of access to services and goods, political disempowerment, etc.<sup>77</sup> Among individuals who are severely obese, compared to their moderately obese counterparts, those with a BMI  $\geq 40$  were found to report higher legal/financial stress 10.2% vs. 30.9% ( $p < 0.01$ )<sup>78</sup> and lower of education (13.9 years vs. 16 years,  $p < 0.01$ ) at levels that are both statistically and clinically significant.<sup>79</sup>

#### **II.D. “The Superwoman Role”**

Cultural expectations play a significant role in how African American women respond to the chronic stressor, RO. In more recent years, these cultural expectations have been the subject of further investigation, and they have been identified, named, labeled and examined as a cohesive group of interconnected factors that have been shown to have both physical and psychological outcomes as well as influence coping responses that have an impact on an individual’s body weight. The culmination of these cultural factors has been termed the Superwoman Role (SR).

The SR developed out of a necessity to survive and has been shaped by a long history of racism, disenfranchisement and oppression, which forced African American women to take on multiple roles including wife, mother, provider, etc.<sup>56</sup> Being a “superwomen” is a role that is reinforced by community perceptions/ideas/values that Black women do not get depressed and they do not need assistance to manage their life struggles.<sup>59</sup> Woods-Giscombe et al. (2010) conducted focus groups with a diverse sample of 48 African American women living in the southeastern US in order to explore the benefits and liabilities of this role and how this cultural concept influences overall well-being.<sup>56</sup> From her work, five interrelated characteristics emerged,

and three are particularly relevant to how African American women view(3) resistance to being vulnerable or dependent.

### *An Obligation to Manifest Strength*

Women reported that given the trials their ancestors had endured, by comparison, their personal trials were much smaller, and they should have to endure them. There was a sense of doing this “for the sake of family and friends”. While the manifestation of strength was a source of pride for these women, it was also a source of stress.<sup>56</sup> Beauboeuf-Lafontant (2007) attest that the assumptions that comprise the “Strong Black Woman” construct is deleterious to the health of African American women for several reasons. These assumptions include: (1) strong Black women are the stark opposite of weak, feminine Caucasian women; (2) “strength” is a natural quality of Black women and a litmus test for their womanhood; (3) being strong accurately characterizes Black women’s motivations and behaviors. She goes on to describe how women without visible adversity in their lives could be viewed by other African American women as “weak”, “not Black” or “White”.

Regrettably, many African American women report that the manifestation of strength in their lives is merely a façade to meet cultural expectations and fend off the criticism of others. Beauboeuf-Lafontant et al. 2007 suggest that over the long-term this disparity between truth and reality may result in both physical and psychological distress and depression. In a series of focus groups focused on understanding the role of social support in diabetes management, African American women reported that they felt their family members’ attempts to provide support threatened their self-perceptions of being strong, Black, independent women, which resulted in feelings of powerlessness.

### *An Obligation to Suppress Emotions*

A “silencing paradigm” as described by Jack (1991) can result in depression as a result of women being socialized to believe that their acceptance in their community and personal well-being are dependent upon their embodiment of certain values.<sup>80</sup> This is especially troublesome since African American women are already at higher risk for depression due to their higher risk of poverty, unemployment, low educational attainment and single parenthood.<sup>81,82</sup> Unfortunately, depression is viewed by many Black women as a “White Illness” and is seen as a sign of weakness and considered “intolerable” further incentivizing suppression of these feelings instead of reaching out to others for support.<sup>59</sup>

### *Resistance to Being Vulnerable or Dependent*

Again, tied into the strength concept is the resistance to being seen as vulnerable or dependent. Women report not knowing how to accept help and a desire to want to prove to others that they can make it on their own.<sup>56</sup> Carter Edwards et al. (2004) describe how African American women were reluctant to accept support because it was a threat to their perception of themselves as strong and independent. One reason for resisting support as suggested by Ford et al. (1998) is that the acceptance of social support implies that the acceptor of the support will be expected to return the favor of support in the future.<sup>71</sup> Interestingly, while some studies have discussed the importance of female networks among African American women for social support,<sup>83,84</sup> the women in Beauboeuf-Lafontant et al. (2007) rarely if ever discussed the role of support from other women.

## **II.E. Stress Coping Strategies and Body Weight**

The adverse physical and psychological outcomes that African American women experience as a result of their embodiment of the SR (e.g. low social support, physical

exhaustion, depression, psychological distress and powerlessness) contribute to high levels of chronic stress. Chronic stress is then exacerbated by the acute stressors—such as a death or illness of a loved one, conflicts with family members or coworkers etc.—which these women experience on a regular basis. The literature indicates that there are three common deleterious stress coping mechanisms that are used by African American women including: (1) decreased physical activity,<sup>55,85</sup> (2) bingeing/night eating,<sup>86,87</sup> and (3) increased intake calories primarily via “comfort foods”.<sup>39,88</sup> These three coping behaviors—discussed individually below—have a negative impact on body weight.

#### *Low Levels of Physical Activity*

A recent report from the American Heart Association reported that compared to their Caucasian counterparts, the number of African American women meeting the 2008 National Physical Activity Guidelines for Americans are considerably lower (19.1% vs. 11.2%).<sup>89</sup> Similar findings were found in the 2005 Behavioral Risk Factor Surveillance System data, which found that only 36.3% of African American women reported engaging in regular exercise compared to 49.8% of Caucasian women.<sup>90</sup>

The evidence is clear, even among various racial population sub-groups that lower levels of physical activity are associated with body weight.<sup>91</sup> While like many lifestyle behaviors there are many determinants that influence an individual’s physical activity levels there is evidence that among African American women, stress—specifically the stress caused by role strain—is a significant contributor to low levels of physical activity. For example, in a cross-sectional study of 90 low-medium income African American women, correlational analysis showed that chronic stress ( $r = 0.22$ ,  $p = 0.02$ ) and physical exercise ( $r = 0.3$ ,  $p < 0.01$ ) were significantly correlated with BMI. Furthermore, a test for mediation revealed that with every unit increase in chronic

stress, physical exercise decreased 0.08 ( $p < 0.01$ ). Women in the study who identified family/friends as their most important stressor had higher mean BMI levels, which were associated with lower physical exercise.<sup>55</sup>

Two cross-sectional studies in African American women have indirectly identified role strain as a barrier to engaging in physical activity. The first is a cross-sectional study of 917 African American women in South Carolina that found that meeting the current physical activity recommendations was associated with having lower role strain.<sup>92</sup> The second, conducted in Maryland ( $n = 234$ ) found that inactive women were more likely to have a partner, belong to community groups and/or have more social roles.<sup>85</sup>

### *Compulsatory Eating Behaviors and Disordered Eating Patterns*

#### BINGE EATING DISORDER

Only in the past few decades have researchers really begun to explore the prevalence of Binge Eating Disorder (BED) and Night Eating Syndrome (NES) within these two specific sub-groups (e.g. African American women and individuals who are severely obese) as well as the significance they may have on impairing weight loss. BED was only recently added to the Diagnostic and Statistical Manual of Mental Disorders DSMV), which was published in 2013.<sup>93</sup>

BED diagnostic criteria include:

BED diagnostic criteria include:

1. Recurrent episodes of binge eating.

**NOTE** An episode is considered a binge only when both of the characteristics below are present.

- ☒ Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most people would eat in a similar period of time under similar circumstances

- ☑ A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).
- 2. The binge eating episodes are associated with at least three of the following characteristics.
  - ☑ Eating much more rapidly than normal
  - ☑ Eating until feeling uncomfortably full
  - ☑ Eating large amounts of food when not feeling physically hungry,
  - ☑ Eating alone because of feeling embarrassed by how much one is eating
  - ☑ Feeling disgusted with oneself, depressed, or very guilty afterward.
- 3. Marked distress regarding binge eating is present.
- 4. The binge eating occurs, on average, at least once a week for 3 months.
- 5. The binge eating is not associated with the recurrent use of inappropriate compensatory behavior as in bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa.<sup>93</sup>

While eating disorders, including BED, were once thought to be rare among ethnic minorities, recent studies are calling into question the accuracy of those beliefs. A population-based, cross-sectional study in the San Francisco area found that prevalence of BED was 5% in African American women compared to 2% in Caucasian, although the results were not statistically significant.<sup>86</sup> This is consistent with a more recent cross-sectional study by Taylor et al. (2007) that used data collected from the National Survey of American Life (n = 5,191 African American adults), which found that among African American women, 2.36% met the qualifications of a BED diagnosis and 5.82% reported any binge eating behaviors.<sup>87</sup> A 1994 study reporting on the results of 600 Essence magazine readers found that 38% of respondents report experiencing “Eating binges I can’t stop”.<sup>94</sup> Finally, a study by Harrington et al. (2010) found that greater levels of distress among African American women were positively associated

with “more emotional inhibition/regulation difficulties, eating for psychological reasons, and ultimately binge eating”.<sup>95</sup>

More specifically, in that same study, the researchers sought to design and test (via structural path analysis) a model of binge eating with African American women who are trauma survivors to discover the mechanisms through which experiences with trauma/stress were related to BED symptomology.<sup>95</sup> Several significant mediating variables were found including identification with “Strong Black Woman Ideology” and “Eating for Psychological Reasons”. The details of these relationships are depicted in Figure 3.

Unfortunately, there seems to be no data as to whether the prevalence of BED or BED symptoms varies within African American women by the degree of obesity. However, several studies have provided evidence that the prevalence of binge eating is high among obese and individuals who are severely obese in general. In a study of individuals seeking bariatric surgery (n = 552, 19.7% African American), 55% of the Class III obesity individuals reported some level of BED.<sup>96</sup> Loro et al. (1981) report that 28.6% of obese patients disclosed binge eating (defined as the consumption of “large or enormous quantities of food in short periods of time”) at least 2 times per week and an additional 22% reported this practice at least once a week.<sup>97</sup> Gormally et al. (1982) report that in a sample of 112 obese patients seeking treatment for obesity 23% had “serious problems with binge eating”, 55% had “moderate problems” and only 22% had “little or no problems with binge eating”.<sup>98</sup> Marcus et al. (1985) report that in a sample of 432 women (race/ethnicity not reported) seeking treatment for obesity at the University of Pittsburgh school of Medicine 46% reported having serious problems with binge eating, 36% reported moderate problems and only 17.9% reported little or no problems.<sup>99</sup> Finally, a study with 81 obese or individuals who are severely obese presenting for treatment at Eating Disorders Clinic at



Stanford University, a significant correlation ( $r = 0.42$ ,  $p < 0.01$ ) was found between binge eating status and BMI scores. Most notably that the percent of subjects who are binge eaters increases markedly above a BMI of  $34 \text{ kg/m}^2$ .<sup>100</sup>

#### NIGHT EATING SYNDROME

Unlike BED, NES has not yet been given a specific/separate diagnostic code in the DSMV. Rather, NES falls into a more general, catch-all category, which can be used when disordered eating is clearly present but none of the other diagnostic codes accurately describe the condition. The DSMV describes NES as:

Recurrent episodes of night eating, as manifested by eating after awakening from sleep or by excessive food consumption after the evening meal. There is awareness and recall of the eating. The night eating is not better explained by external influences such as changes in the individual's sleep-wake cycle or by local social norms. The night eating causes significant distress and/or impairment in functioning. The disordered pattern of eating is not better explained by binge-eating disorder or another mental disorder, including substance use, and is not attributable to another medical disorder or to an effect of medication.<sup>93</sup>

The prevalence of NES in the general adult population is estimated to be approximately 1.5%.<sup>101</sup> Unfortunately, there is very limited information regarding the prevalence of NES among minority groups including African American. However, in a 2007 study by Malpede et al. in Alabama, African American women taking part in focus groups reported that they would eat large amounts of unhealthy snacks—particularly at bedtime—when feeling stressed.<sup>102</sup> Additionally, a cross-sectional study of 682 African American women found that the prevalence of NES was ~1.5% ( $n = 20$ ).<sup>103</sup> Perhaps the more interesting aspect of this finding is that African American women with NES were significantly more likely to have two or more children, which supports the RO phenomenon in the development of disordered eating patterns.

As with BED, the link between body weight and NES is stronger. As reported in a critical review by Vander Wal et al. (2012), the prevalence of NES has been found to be: 4.3% 8.9% in

weight loss samples, 10.1% of class II–III obese adults, 15% of severely obese adults and 8–42% of gastric bypass candidates.<sup>101</sup> Other studies by Cleator et al. (2012) and Colles and al. (2007) had similar findings.<sup>104,105</sup>

Although the associations between body weight and BED/NES are relatively clear, there are many questions that remain regarding the etiology of BED/NES and weight gain,<sup>104-106</sup> especially the important question of whether BED/NES precedes weight gain or vice versa.<sup>101</sup> However, one study by Yanovski et al. (1992) reports that women with BED have been found to consume significantly more calories at a single meal setting than those without a BED diagnosis (2963 kcals vs. 2017 kcals,  $p < 0.01$ ).<sup>107</sup>

There are also mixed reviews on whether these two disorders impact weight loss outcomes. In one case-control weight loss study using a very low calorie diet (VLCD), the presence of NES did not appear to impact weight loss outcomes.<sup>108</sup> Although another prospective case-control weight loss study (again, using a VLCD) with 38 obese women (21 with BED diagnosis and 17 with no BED diagnosis) found similar results with regards to the absolute weight loss at 26 weeks, those with BED reported a greater number and more severe lapses than those without BED during the refeeding period ( $p = 0.03$ , posthoc Fisher LSD test). This finding raises concerns about the ability of those with BED to successfully maintain the lost weight after the intervention period.<sup>109</sup>

#### *Increased Caloric Intake Primarily Through “Junk Foods”*

A 2009 study by Sharma et al. (2009) that investigated the dietary intake patterns of an inner-city African American population found that the top contributors to energy were sodas (9.5%, #1), cake and pastries (4.3%, #4), sweetened drinks (3.8%, #6), chips (3.7%, #7) and candies (2.9%, #10).<sup>110</sup> The top contributors to fat included frankfurters and sausages (8.1%, #2),

chips (6.3%, #3) and cake and pastries (5.1%, #6). Top contributors to sugar intake (natural and added) were sodas (34.1%, #1), sweetened drinks (15.2%, #2) sweetened juices (9%, #3), sugar/syrup (8.3%, #4), cake and pastries (4.2%, #5), candies (4.1%, #6), ice cream (3.2%, #7) and cookies (2.5%, #8). As can be seen in Table 1, these results are similar to those for all Americans (as assessed by the 2003–2004 and 2005– 2006 National Health and Nutrition Examination Survey). From these data it is clear that prepared/pre-packaged foods make up a large portion of the diets most Americans—including African Americans. This is problematic as these types of foods are usually high in calories, unhealthy fats, refined carbohydrates and sugar while also being low in essential vitamins and minerals.

There are many personal, cultural, historical, economical and environmental factors that determine any individual's dietary intake – both quality and quantity. For African American women, one of the main contributing factors is hypothesized (by the author, DFB) to be stress. Increased stress levels have been associated with increased preference for and consumption of high fat foods in animal studies<sup>39</sup> and among African American women.<sup>88</sup> Studies conducted in London and Saudi Arabia have found that during times of stress, women especially, have been shown to have a preference for sweets and chocolate<sup>111,112</sup> and a study by Grunberg et al. (1992) found that women in a “high stress” condition ate about twice as much sweet food than women in a “low stress” condition.<sup>113</sup>

Epel et al. (2000) attest that there are biological explanations for our preferences for both carbohydrate and fat during times of stress in suggesting that there is laboratory evidence in animals that indicates that adrenal steroids influence macronutrient selection by increasing appetite for these two nutrients.<sup>51</sup> Also, as described previously, African American women also face a different set of challenges due to their time restraints (both real and perceived) that result

from economic challenges, obligations to friends and family (e.g. the MCR) and ineffective coping responses. Thus prepared/prepackaged foods offer a convenient option for feeding their families when they are short on time.

While no studies were found characterizing the specific types of foods individuals who are severely obese and/or African Americans consumed in response to stress, a study comparing oral responsiveness differences for sweet foods between African American and European Americans found that habituation was similar between the two groups for all except the sweetest food, which African Americans showed no habituation.<sup>114</sup> Among the 7 sweet foods sampled African Americans had a significantly greater desire for another taste of the same food, which was correlated with the degree of sweetness intensity. The authors also measured perceived stress levels in all participants and found that they were higher among the African American participants, and the authors postulate that the higher stress levels may contribute to the increased desire for sweet tasting foods.

## **II.F Other Contributors**

There are many other factors that play an important role in determining body weight among African American women who are severely obese that do not fit within the framework of the stress-coping response model. These factors can be classified into three basic categories: (1) cultural factors, (2) physical limitations and (3) genetics.

### *Cultural Factors*

Three important cultural factors are important to discuss in relation to body weight. First, cultural preferences and traditions impact food selection among African American women. Although there are many factors that determine food choice, the cultural tradition of “soul foods” is important to consider. Despite the many healthy aspects of soul food such as a variety greens,

sweet potatoes, legumes, okra and tomatoes,<sup>115</sup> there are also less desirable aspects including high sodium content. African American women taking part in focus groups have identified “soul food” as an important part of their food culture and its negative impact on body weight.<sup>102</sup> It will be important for a weight loss intervention for African American women to build on the work published by other authors on how to make healthy, acceptable modifications to “soul foods”.

The role of culture in physical activity is also important to consider. More specifically, time commitments and extra costs related to “hair maintenance activities” that are often required after physical exertion have been identified as a major barrier to engaging in physical activity.<sup>102</sup> Another cultural issue relates to how African American women perceive different types of exercise. In a series of focus groups with 48 African American women, participants described three types of women including (1) the physically active (e.g. entire day filled with activities, involved in the lives of her children and grandchildren, “chasing kids all day” and involved in social groups, (2) the physically inactive woman (this woman has difficulty getting out of bed, her children slept late, she does nothing all day, has low self-esteem and limited energy and was unemployed) and (3) the “exerciser” (the woman who exercises for leisure time activity, goes jogging, aerobics or exercise equipment, eats very little and/or very healthy, these types of exercise were associated with being Caucasian). Most women in the groups described themselves as physically active.<sup>116</sup> Thus, weight loss interventions designed for African American women must consider: (1) how to overcome the significant barriers associated with hair maintenance, (2) ways to build upon the physical activities African American women are already engaging in as part of their daily activities and (3) ensure that any additional exercise that is recommended is culturally appropriate.

Finally, several studies have documented differences in perceptions of body image between Caucasian and African American women. More specifically, Caucasian women tend to perceive themselves as overweight whereas African American women are more likely to underestimate their body size.<sup>117,118</sup> A woman's view of her ideal body size is determined by many factors. Social norms are certainly important as African American women have reported identification with a larger body size because it provides a sense of belonging among friends and family members who are also overweight or obese.<sup>57</sup> Similarly, African American women have reported that African American men have a more accepting attitude towards full-figured women and have "reported that male family members, particularly fathers and husbands encourage them not to lose too much weight because they don't like 'bony women'".<sup>102</sup> Interventions for African American women must consider how their perception of their current body weight and the opinions of friends and family may or may not be a source of motivation in a weight loss trial.

### *Physical Limitations*

A qualitative study conducted by Wiklund et al. (2010) sought to explore the perceptions of individuals who are severely obese about exercise. The authors report that half of the participants interviewed (e.g. 9 of 18) reported experiencing pain in their feet, knees and or hips and onethird reported back pain.<sup>119</sup> A common theme among the interviews was the impact of excess weight on the ability to engage in physical activity. More specifically, participants discussed issues with joint strain and feeling clumsy. All of these ailments could impair a basic activity of everyday life: walking. In fact, a 2012 study by King et al. of 2,458 bariatric surgery candidates found that 64% had difficulties in walking several blocks, 48% had an "objectively defined mobility deficit" and 16% used a walking aid. The results of a multivariate analysis found that BMI was positively and independently ( $p < .05$ ) associated with physical discomfort

during walking. This finding has been confirmed by another study by Hergenroeder et al. (2011).<sup>120</sup>

The ability to walk without impediment, pain or discomfort is an important part of engaging both activities of daily living and leisure time physical activity,<sup>121</sup> a primary target of this intervention. Walking impairments have also been associated with depression<sup>122</sup> and health related quality of life.<sup>121</sup> As a result, improving physical limitations (where needed) will be an important target of this intervention.

Participants in the study by Wiklund et al. (2010) also reported several social barriers to engaging in regular physical activity. They reported that exercising with others was often difficult because their fitness levels tended to be lower than that of their friends. This is significant because many of the participants expressed the importance of having company while exercising. The participants in this study also expressed being uncomfortable in gym clothes and reported embarrassment about their bodies as a barrier to engaging in regular physical activity.<sup>119</sup>

### *Genetic Makeup*

Genetic differences relevant to body weight have been found in African Americans<sup>123</sup> and individuals who are severely obese.<sup>45</sup> However, the current literature suggests that the overall impact of genes is comparatively little compared to that of lifestyle behaviors. Twin studies conducted by Berg et al. (1983) and Plomin et al. (1990) reveal that genetics do not account for all of the variability in an individual's stress response.<sup>124,125</sup> Supporting this claim, West et al. (2010) and Mwednwa et al. (2011) attest that it is the moderating effect of coping styles, including maladaptive eating, that is of greater importance.<sup>47</sup>

## **II.G Summary**

The conceptual model presented in Figure 1 is a visual depiction of a hypothesis for the development of severe obesity in African American women. Decisions regarding which constructs to include in the model and how to depict the relationships between those constructs were based on an extensive review of the literature. Moving from left to right, the model visually explains how the unique types of contextually defined chronic stressors that African American women experience related to RO, when viewed through the eyes of a woman embodying the SR, can have deleterious psychosocial consequences (feelings of powerlessness, depression, etc.). This confluence of events puts women in an ill-prepared state—both physically and mentally—to cope with the acute/day-to-day stressors. Because the physical and mental energy that is often needed to engage in healthy stress-coping tactics are lacking, unhealthy coping behaviors—including binge eating and deciding not to exercise—become the default. Although unhealthy stress-coping behaviors may temporarily relieve the stress, they offer little if any relief over the long-run.



Figure 1: A conceptual model depicting a hypothesis for the development of severe obesity in African American women

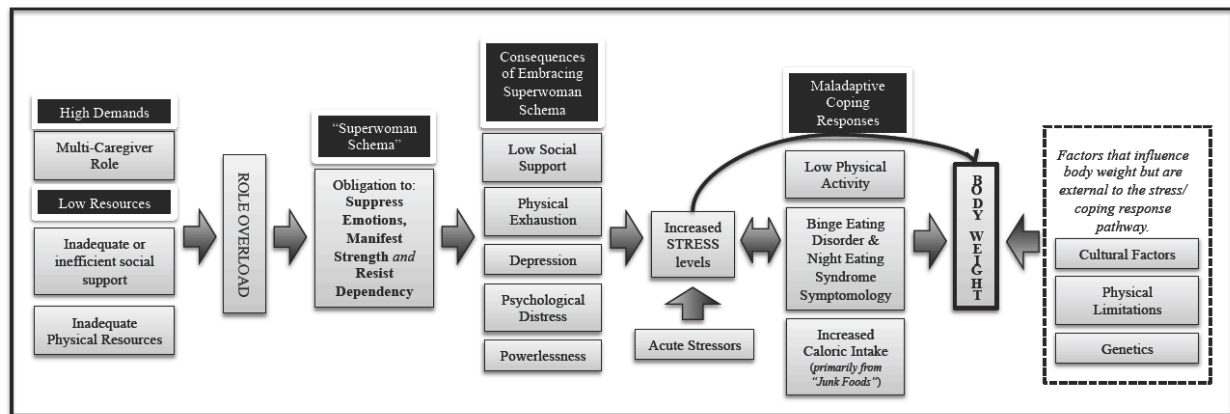


Figure 2: Factors influencing the stress-obesity relationship based on previous models by Lazarus et al. (1984) and McEwen et al. (1993)

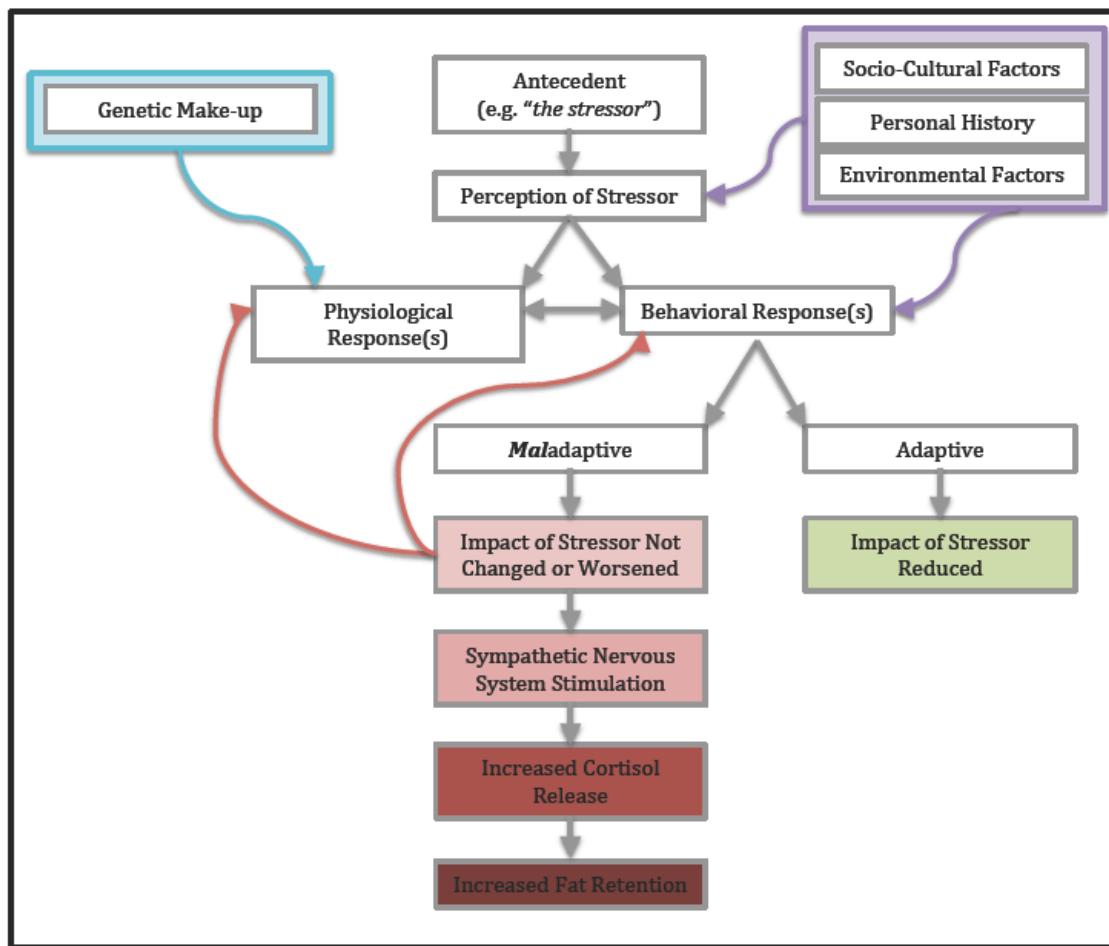


Figure 3: Mediators of the relationship between “Trauma Exposure/Distress” and “Binge Eating” among African American women based on the findings presented in Harrington et al. (2010)

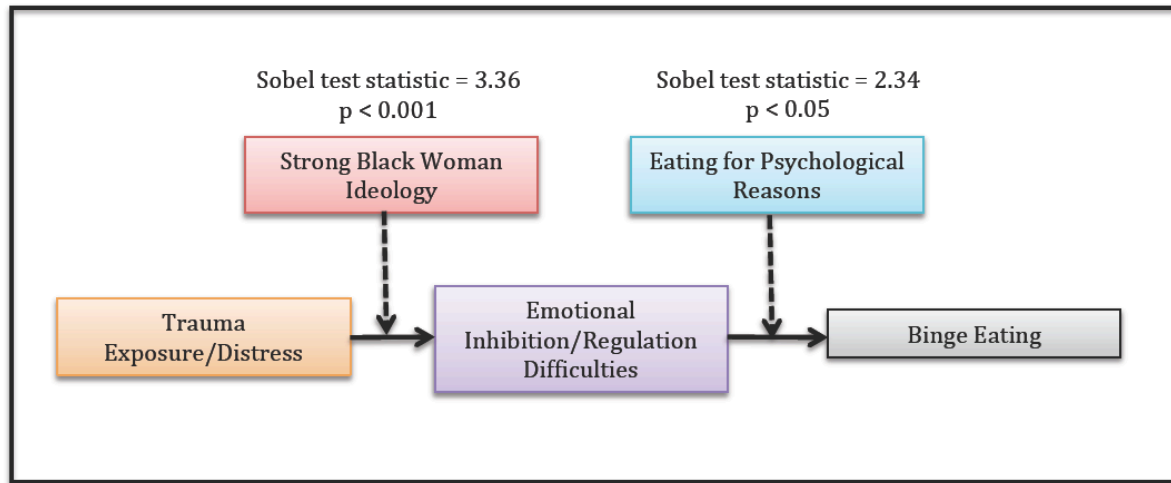


Table 1: Top food categories that contribute to caloric intake, all Americans vs. African Americans only

	All Americans <sup>126</sup> %	African Americans Only <sup>110</sup> %
#1	7.2% <i>Cakes, Cookies, Quick Bread, Pastry, Pie</i>	9.5% <i>Sodas</i>
#2	7.1% Yeast Breads and Rolls	8.2% Chicken Dishes
#3	5.4% <i>Soft Drinks/Soda</i>	6.0% Breads
#4	4.7% Beef	4.2% <i>Cake and Pastries</i>
#5	4.7% <i>Crackers, Popcorn, Pretzels, Chips</i>	4.0% Sandwiches and Burgers
#6	4.6% Cheese	3.8% <i>Sweetened Drinks</i>
#7	4.6% Milk	3.7% <i>Chips</i>
#8	4.5% <i>Candy, Sugars, Sugary Foods</i>	3.3% Pasta Dishes
#9	4.3% Poultry	3.1% Meat Dishes
#10	3.7% <i>Alcoholic Beverages</i>	2.9% <i>Candies</i>

## **CHAPTER III: LITERATURE REVIEW**

### **III.A. Obesity Defined**

Obesity is a health condition that is characterized by the excessive accumulation and storage of fat in the body. Obesity is commonly measured and defined via Body Mass Index (BMI). BMI is determined by dividing a person's weight in kilograms by the square of their height in meters. Although BMI is not a perfect assessment of true obesity, it has been associated with higher rates of both morbidity and mortality.<sup>127,128</sup> Overweight and obesity are defined by BMI ranges; normal/healthy weight = BMI 18.5 – 24.9 kg/m<sup>2</sup>, overweight = BMI 25.0 – 29.9 kg/m<sup>2</sup>, obesity class I = BMI 30 – 34.9 kg/m<sup>2</sup>, obesity class II = BMI 35 – 39.9 kg/m<sup>2</sup> and obesity class III (also known as severe obesity) = (BMI  $\geq$  40 kg/m<sup>2</sup>).

### **III.B. Contributors to Obesity**

At the most basic level, obesity is the result of an imbalance in energy (calories) consumed and energy (calories) expended. When we consume more energy than our body needs, the excess energy is stored as fat. Fat is a relatively efficient way to store energy; at 9 calories per gram it can hold more than twice the calories than carbohydrates and protein (both 4 calories per gram). The two primary determinants of body weight—energy (calories) consumed and energy (calories) expended—are influenced by a variety of internal and external factors such as: genetics, social or cultural norms, environment/access and others. The socialecological model (SEM) is a commonly used framework for organizing and describing these factors as well as understanding their often reciprocal and dynamic relationships<sup>129</sup> (see Figure 4). The Centers for

Disease Control defines the SEM as a framework that “considers the complex interplay between individual, relationship, community, and societal factors”.<sup>130</sup> The relationships between these factors are both complex and dynamic and remain a popular subject in public health research. Table 2 provides more details about the five levels of the socialecological model including examples for factors at each level that could impact (1) energy consumed through diet or (2) energy expended through physical activity.

The quality and amount of information available about each of these factors—and the many others that have been identified—varies widely. Obesity is a difficult phenomenon to study and understand, primarily due to the number of contributory variables and the complex interactions between those variables. These challenges are exacerbated by the inherent issues that are common to most social science research such as ensuring methodological rigor, comparing findings across studies that operationalize variables differently and lack of statistical methodologies that match the complexity of the relationships that are being investigated.

### **III.C. Obesity, Disease Risk and Public Health Consequences**

Obesity is a health risk because visceral fat is a metabolically active tissue, not just a storage repository for excess calories. Adipose tissue secretes many hormones including: insulin, estrogen, leptin and prostaglandins. Thus, changes in the amount of body fat can have endocrinologic consequences, which, in turn, can disrupt many physiological processes such as insulin sensitivity, lipid metabolism, and inflammation. These endocrine fluctuations are believed to be at the root of the development of many chronic diseases, including cancer, stroke, heart disease, hypertension, dyslipidemia, gynecological abnormalities and others.<sup>131-133</sup> Currently, With more than two-thirds of the American adult population being classified as overweight or obese,<sup>134</sup> the healthcare expenditures to treat the chronic diseases that are linked to

obesity are estimated to range from \$147 - \$210 billion per year,<sup>135</sup> and absenteeism related to obesity is believed to cost employers over \$4 billion annually.<sup>136</sup>

### **III.D. Rationale For Severe Obesity as a Public Health Priority**

As previously stated, class III or severe obesity is defined as having a BMI  $\geq 40$  kg/m<sup>2</sup>). The data indicate that the degree of excess weight matters when it comes to disease risk and treatment costs (due to needing more care and higher risk of complications when receiving care).<sup>128,137</sup> Even compared to their overweight (BMI 25 – 29.9 kg/m<sup>2</sup>) and obese (BMI 30 – 39.9 kg/m<sup>2</sup>) counterparts, severely obese patients incur healthcare costs are both clinically and statistically higher.<sup>1,137,138</sup> The number of individuals who are severely obese in the United States is growing rapidly. In fact, from 2001 to 2005 the prevalence of individuals with a BMI  $\geq 40$  increased at more twice the rate than those with a BMI  $\geq 30$  (52% vs. 24%).<sup>1</sup> See Figure 5 for more details.

This deleterious combination of increased disease risk and treatment costs combined with the exponential growth in prevalence rates, makes developing effective treatments for severe obesity a top public health research priority. Because risk disparities are the fundamental cause of health disparities and addressing health disparities has been a priority for the past two decades for the Healthy People initiative. In Healthy People 2020 the goal is “to achieve health equity, eliminate disparities, and improve the health of all groups”.<sup>139</sup> Research on severe obesity should prioritize development treatments for African American women because data from the National Health and Nutrition Examination Survey indicate that in 2010 African American women were more than twice as likely to be severely obese than their Caucasian counterparts (18% vs. 8%).<sup>140</sup>

### **III.E. Surgery as a Treatment for Severe Obesity**

Multiple studies and reviews indicate that bariatric surgery is clearly an effective treatment for reducing body weight in individuals who are severely obese across all races.<sup>141</sup> And, for certain populations, weight loss surgery is an appropriate and accessible option. However, concerns remain about the ability of this one type of treatment to meet the growing population demand given that only 1% of all severely obese adults in the US undergo bariatric surgery each year.<sup>142</sup> Not only is there concern about being able to meet growing demand, it is important to note that surgery is not a lifetime cure for obesity nor is it successful in every patient.

### **III.F. Pharmacotherapy as a Treatment for Severe Obesity**

One of the most common weight loss drugs on the market is Xenical (*generic*, orlistat), which alters fat absorption by reducing secretion of pancreatic lipases. A 2004 systematic review of the effectiveness of orlistat for weight loss reviewed 23 placebo-controlled trials and found that the drug was effective at producing significantly greater weight loss, but only in the order of approximately 3 kg compared to control<sup>143</sup>. For those individuals with diabetes the effect of orlistat was smaller (about 2.5 kg between groups).

Lorcaserin is another popular weight loss drug that was only recently approved for use in the US in 2012. Lorcaserin helps to promote weight loss by acting as a serotonin agonist, which reduces appetite. Although there are fewer studies documenting the efficacy of lorcaserin (compared to orlistat), its efficacy when combined with diet and physical activity changes seems to be similar to that of orlistat (e.g. ~ 3kg).<sup>144-146</sup>

No data seem to be available on how the efficacy orlistat or lorcaserin varies by degree of obesity in adults. However, one study has been done with orlistat in adolescents comparing



differences in weight loss between AAs and Caucasians. At the end of the 6-month treatment involving orlistat and a comprehensive behavioral program, compared to their Caucasian counterparts, AA subjects exhibited significantly less improvement in weight ( $p < 0.05$ ) and BMI ( $p < 0.01$ ).<sup>147</sup>

In summary, it appears that both lorcaserin and orlistat can have a statistically significant and positive impact on weight loss. However, the magnitude of this impact is relatively small (~3 kg.) and many questions remain including how the drugs may perform differently by race/ethnicity, by degrees of body weight and to what degree they have a positive effect on other health outcomes such as heart disease and diabetes.

### **III.G. BWL Programs as a Treatment for Severe Obesity**

Behaviorally-based programs use a combination of diet, physical activity and behavior modification to help individuals lose weight. Research has demonstrated the efficacy of BWL programs. Unfortunately, much of what is known is based on studies with samples that are predominately Caucasian and overweight or moderately obese. More research is needed on how to develop effective BWL programs for African American women who are severely obese. In addition to the previously discussed concerns regarding the adequacy of surgery to meet growing demand, there is evidence that surgery may not be the most viable or appropriate treatment for African American women due to economic barriers (including lack of insurance coverage) or cultural concerns such as fears of compromising their figures by losing too much weight.<sup>57,148,149</sup> Safety is also an issue to consider; a 2011 study by Turner et al. found that African Americans have 3 times the risk of experiencing a pulmonary embolism after bariatric surgery than their Caucasian or Hispanic counterparts.<sup>150</sup>

According to the 2013 American Heart Association/American College of Cardiology /The Obesity Society (AHH/ACC/TOS) guidelines for the management of overweight and obesity in adults, effective lifestyle interventions for weight loss should include at least three primary components: (1) prescription of a reduced calorie diet designed to induce healthy weight losses of 1 – 2 lbs./week, (2) recommendations for an increased physical activity regimen and (3) the incorporation of behavioral strategies to facilitate adherence to diet and activity recommendations.<sup>151</sup>

Short-term comprehensive BWL programs can expect to produce an average weight loss between 5-10% of initial body weight (or approximately 8 kg) over the course of 6 months. While bariatric surgery can result in weight losses that are 3–5 times greater,<sup>152</sup> moderate weight losses such as these can have a profoundly positive impact on health for the individual. Moderate weight loss has been linked to improved health-related quality of life,<sup>153</sup> improved HbA1c levels,<sup>154</sup> reduced risk of cardiovascular disease<sup>155</sup> and others. At the population level, a 5-10% reduction in body weight could have a profound impact on the economic burden of obesity.

#### *BWL Programs | Diet*

The composition of the prescribed diet has varied through the years. A variety of dietary approaches have been used successfully in weight loss interventions including: higher protein diets (25% of total calories from protein, 30% of total calories from fat, and 45% of total calories from carbohydrate), lacto–ovo–vegetarian–style diets, low-carbohydrate diets (initially <20 g/d carbohydrate), low–glycemic–load diets and many other variations. Low carbohydrate diets ( $\leq$  40% of calories from carbohydrates and 30-55% of calories from fat) and low fat diets (approximately 60% of calories from carbohydrates and < 20% of calories from fat) are two popular approaches seen in commercial weight loss programs. With regards to weight loss

outcomes the literature indicates that the most important factor is that the dietary approach creates a large enough calorie deficit to induce weight loss.<sup>151</sup> For example, a meta-analysis published in the Journal of the American Medical Association found that there were no significant differences in mean weight losses between the two approaches at 6-month follow-up (8.73 kg vs. 7.25 kg, respectively).<sup>156</sup>

However, because weight losses must be maintained in order to retain the associated health benefits, adhering to the dietary approach over the long run is critical. Studies have shown that low-fat diets can be more challenging for individuals to sustain.<sup>157</sup> In contrast, studies with energy-restricted Mediterranean-style diets have had more promising results with regards to long-term adherence.<sup>158</sup> The macronutrient composition of the Mediterranean diet could be described as “moderate” and falling somewhere inbetween the two more extreme dietary approaches of low-fat and low-carbohydrate. Mediterranean-style diets are characterized by their focus on plant-based foods (fruits, vegetables, legumes, nuts and whole grains), healthy fats (monounsaturated) and substituting red meat for fish or poultry.<sup>159</sup> In addition, the Mediterranean diet has been shown to have health benefits independent of those associated with weight loss including reducing the risk of central obesity, hyperglycemia, depression, cardiovascular disease and type 2 diabetes.<sup>160,161-163</sup>

There are many methods for determining estimated calorie needs ranging by degree of precision, cost and participant burden.<sup>164</sup> Predictive resting energy equations—such as the Mifflin-St.Jeor Equation—are typically used to estimate calorie needs<sup>165</sup> primarily because they are both quick and cost-effective. The Mifflin-St. Jeor Equation uses height, weight, age and gender data to produce an estimate of resting energy expenditure. The calculated resting energy expenditure is then usually multiplied by a factor ranging between 1.2 – 1.9 to accommodate for

level of physical activity and/or injury. Subtracting 500 – 1000 calories from the final daily caloric estimate should be a good guide to create an energy deficit that will result in the loss of 1 – 2 pounds per week.

#### *BWL Programs | Physical Activity*

The recommendation for physical activity for lifestyle weight loss intervention programs is the prescription 150 minutes per week ( $\geq 30$  minutes/day on most days) of aerobic activity. This goal can be met gradually over the course of the intervention, however increasing this goal to 200 – 300 minutes per week is recommended to maintain weight losses. Brisk walking or a comparable aerobic exercise is often recommended primarily due to its low risk and low cost. There are no citations in this section – you should site the obesity guidelines and the ACSM position statement on PA for weight loss at minimum.

#### *BWL Programs | Behavior Therapy*

A structured behavior therapy program is a recommended component of lifestyle interventions. Self-monitoring of diet, physical activity and/or weight is frequently incorporated into the program. Although not included in the (AHH/ACC/TOS) guidelines, the use of theory or theoretical constructs in a structured behavior program for lifestyle interventions can be beneficial in many ways. Theory provides a framework for designing, implementing and evaluating the program. More specifically, theory helps explain the reasons why a particular approach may have worked or failed. It helps researchers understand the direction and importance of the relationships between constructs (like self-efficacy) that are targeted as part of an intervention.<sup>166,167</sup>

Social Cognitive Theory (SCT) is frequently used in health behavior interventions, including those targeting physical activity.<sup>168-170</sup> The authors of the chapter on SCT in the 3<sup>rd</sup>

edition of “Health Behavior and Health Education | Theory, Research and Practice” describe SCT as “a theory that addresses both the psychosocial dynamics in influencing health behavior and methods for promoting behavioral change. [Within the theory] human behavior is explained in terms of a triadic, dynamic and reciprocal model in which behavior, personal factors (including cognitions) and environmental influences all interact”.<sup>171</sup> A selection of the major constructs of SCT (chosen by the author, DFB) based on their relevance to designing BWL interventions) along with their definitions and implications for interventions is presented in Table 4.

Additional evidenced-based recommendations mentioned in the AHH/ACC/TOS guidelines pertain to treatment modality and intervention frequency/duration. With regards to treatment modality, there seems to be no evidence supporting the efficacy of one of the approaches—e.g. individual or group—over the other. Both types of interactions offer unique benefits and challenges to both researchers and participants. When considering meeting frequency and program duration, the AHH/ACC/TOS guidelines suggest a minimum of 14 sessions over the span of at least 6 months.

#### *BWL Programs | Examples*

The Diabetes Prevention Program (DPP) and Look AHEAD research trials are two of the largest and most informative BWL interventions. They also provide some of the strongest evidence on the efficacy of BWL interventions as methods to create meaningful and significant improvements in weight and weight-related comorbidities. Table 3 presents characteristics of these two interventions comparing them to the recommendations set forth in the 2013 version of the AHH/ACC/TOS

### III.H. Tailoring BWL Programs

One of the main benefits of BWL programs is that they can be tailored. Tailoring is “developing...a single intervention approach for a defined population sub-group [taking] into account characteristics [that are] shared by the sub-group’s members”.<sup>172</sup> Tailoring an intervention is believed to improve treatment retention and adherence thereby increasing efficacy. Interventions can be tailored based one or more participant characteristics including: demographics, level of motivation, physical or cognitive limitations, etc..<sup>173,174</sup> Developing BWL programs for African American women who are severely obese that are tailored effectively may be especially important given that higher attrition and lower treatment adherence have been associated with both race<sup>175,176</sup> and BMI.<sup>177</sup>

Cultural tailoring is a frequently used strategy when designing BWL programs for non-White populations.<sup>32</sup> As defined by Resnicow et al., there are two dimensions to cultural tailoring: surface structures and deep structures.<sup>178</sup> Surface-structure modifications are those that involve “matching intervention materials and messages to observable, "superficial" characteristics of a target population” such as through language, images, locations, clothing, etc.<sup>178</sup> Commonly used surface-structure cultural modifications for interventions with African American women include: conducting the intervention in an African American church or matching the race/ethnicity of the interventionist to that of the participants.<sup>179</sup> Surface-structure adaptations theorize that when participants feel more comfortable in the intervention setting or can identify with the interventionist they may be more likely to attend sessions and adhere to the recommendations.

Deep-structure changes involve incorporating the “cultural, social, historical, environmental and psychological forces that influence the target health behavior in the proposed

target population” into the intervention.<sup>178</sup> One of the most frequently used deep-structure cultural modifications is adapting the curriculum content to reflect the values, beliefs and/or cultural norms of the race/ethnicity, gender and/or age of the participants.<sup>179</sup>

In developing BWL programs, caution should be taken when making assumptions about the efficacy of any adaptation when there are differences in age, race, gender or any other potentially relevant participant characteristic. For example, cultural adaptations that are relevant for African American women may not apply to African American men or vice versa. For African American women who are severely obese it is important to consider the potential roles of race, gender and body weight. To date, the studies that provide guidance on how to tailor based on these three characteristics are presented in separate literature bases by race/gender (research with African American females of varying BMI classifications) and by BMI classification (research with severely obese populations of varying races and genders). Very little is known about how the combination of these characteristics may modify needs for BWL program tailoring.

### **III.I. Efficacy of BWL Programs for African American Women**

As discussed previously, BWL programs can produce a weight loss of approximately 5-10% (or 5 – 10 kg) in 4-6 months in the general population.<sup>180</sup> However, these outcomes are not typical for African American women. A review by Fitzgibbon et al. (2012) of weight loss outcomes in African American women examined 25 articles published between 1990 and 2010. The authors report that the average weight change ranged from +0.5 kg to –3.2 kg in 4-6 months with only two exceptions.<sup>32</sup> In the DPP African American women lost on average 4.7 kg (4.5%) and in the Weight Loss Maintenance (WLM) Trial,<sup>181</sup> African American women lost 4.1 kg. One possible explanation for these findings is that both the DPP and WLM trial were large, well-funded research trials that utilized intense intervention strategies and had substantial resources at

their disposal to help facilitate weight loss in participants. However, although African American lost more weight in these studies than other smaller programs, they still lost significantly less (only slightly more than half) than their Caucasian counterparts (8.1%).<sup>3</sup>

The disparity in weight loss outcomes for African American women is the subject of many research papers. The general consensus of the findings from this literature base is that African American women face unique challenges with regards to engaging in healthy lifestyle behaviors and losing weight. For example, a 2015 paper by Joseph et al. summarizes the findings from 42 published studies reporting on barriers African American women face when trying to engage in physical activity. Three levels of the socialecological model were represented in the findings including individual (lack of time and/or motivation), interpersonal (lack of social support or a physical activity partner) and organizational (lack of facilities).

Cultural tailoring has been used in many BWL programs for African American women, but there is very little, if any, consensus on what types of modifications are most important. A review by Fitzgibbon et al. (2012) of weight loss interventions in African American women examined 25 articles and found that there were no differences in outcomes between trials that reported cultural adaptations and those that did not. A similar study by Whitt-Glover et al. (2009) examined 25 published interventions that were focused on improving physical activity levels in African American adults.<sup>182</sup> In their results the authors note that the inclusion of cultural adaptations did not seem to improve physical activity outcomes. They go on to explain that even in the three studies in their review that specifically compared/tested the efficacy of including a cultural adaptation vs. no adaptation, no between group differences were found. Despite the findings of these two review papers, cultural tailoring should not be ruled out as a way to improve treatment efficacy. As the authors of the first review (Whitt-Glover et al.) note,



assessing the efficacy of cultural adaptations was challenging due to the heterogeneity across study designs with regards to both the level (e.g. surface vs. deep) of cultural adaptation as well as the degree to which they were integrated across all program components.<sup>32</sup>

### **III.J. Efficacy of BWL Programs for Severely Obese Populations**

Due to the effectiveness of bariatric surgery there are very few published lifestyle interventions focusing specifically on individuals who are severely obese. Many of the trials that are published, lack methodological rigor and/or were conducted outside of the United States.<sup>20-23</sup> <sup>23-30</sup> Fortunately, there are at least a few studies that stand out as being exceptions to these validity and generalizability concerns. Three separate studies conducted by Samaha et al. (2003), Ryan et al. (2010) and Goodpaster et al. (2010) all use randomized controlled trials to evaluate BWL programs and were conducted in the United States. Details about each of the studies including: sample demographics, intervention components, program intensity (frequency of meeting and duration) and outcomes can be found in Table 5.

Findings from these three studies suggest that lifestyle weight loss interventions can be effective treatment approaches for individuals who are severely obese. Noteworthy findings include the following:

- A weight loss of 5 – 10% of initial body is a reasonable and achievable goal for severely obese individuals taking part in BWL programs.
- Higher BMI may be associated with increased risk of attrition but both participant retention and weight loss outcomes improve with increasing program intensity.
- A prescription of moderate to vigorous physical activity goals for 60 minutes for 5 days a week (progressing to 60 minutes, allowed to accumulate throughout the day in 10-minute

bouts) with a goal of 10K steps per day is appropriate and realistic for severely obese populations.

- Although Very Low Calorie Diets (VLCD) that limit calorie consumption to 900 calories/day are effective at inducing weight loss in severely obese individuals, they may increase the likelihood of participant attrition.
- Using meal replacements is an effective dietary strategy for weight loss but may be cost prohibitive for some programs.

### **III.K. Summary**

The prevalence of severe obesity is growing rapidly in the United States and the most well-documented treatment for severe obesity—bariatric surgery—will not be sufficient to meet this country’s needs. Although research has demonstrated that BWL programs are efficacious treatments for weight loss, we know very little about how to effectively tailor these programs to meet the needs of individuals who are non-white and/or face different physical or psychosocial challenges with regards to weight loss. This knowledge gap is in large part attributable to the paucity of methodologically rigorous studies and the higher attrition risk that is associated with some minority groups and those who are heavier at baseline. Future research studies should investigate strategies to effectively tailor BWL interventions to meet the needs of those individuals who are at highest risk, in this case, African American women who are severely obese. When publishing the results of these studies, authors should be diligent about not only following the CONSORT guidelines for randomized control trials.<sup>183</sup>, but also be sure to include sufficient information for readers to understand the relevant details concerning any intervention tailoring. Where feasible, studies should also monitor and measure the relative efficacy of any tailored components.

Figure 4: Social-Ecological Model of Health

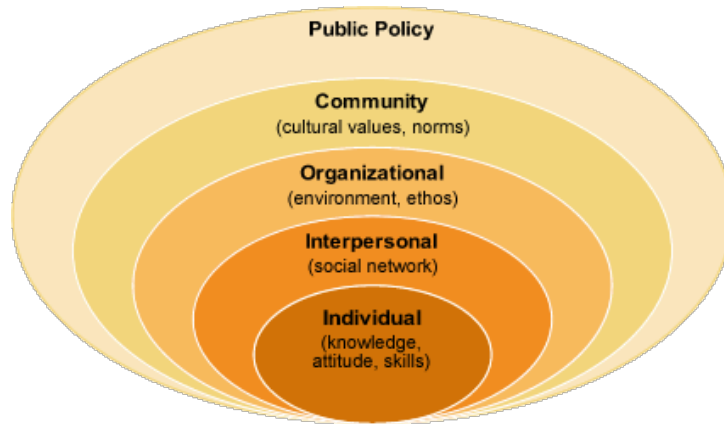


Table 2: Social-Ecological Model (SEM) levels/definitions and examples related to energy balance

SEM Level & Definition	Energy In (Calories Consumed through diet)	Energy Out (Calories Expended through Physical activity)
Individual <i>knowledge, attitude, skills</i>	Taste preferences, food knowledge, physical health	Physical health, physical activity knowledge
Interpersonal <i>social network</i>	Family food preferences	Physical activity habits of friends and family members
Organizational <i>environment, ethos</i>	Food availability (stores, restaurants)	Access to parks, gyms, etc.
Community <i>cultural values and norms</i>	Cultural food norms	Cultural norms regarding physical activity
Public Policy <i>local, state or federal policy</i>	Local, state or federal tax laws on food	Complete streets, joint use agreements.

Figure 5: Percentage increase in BMI categories since 1986 from Sturm et al. (2006) *Reprinted with permission.*

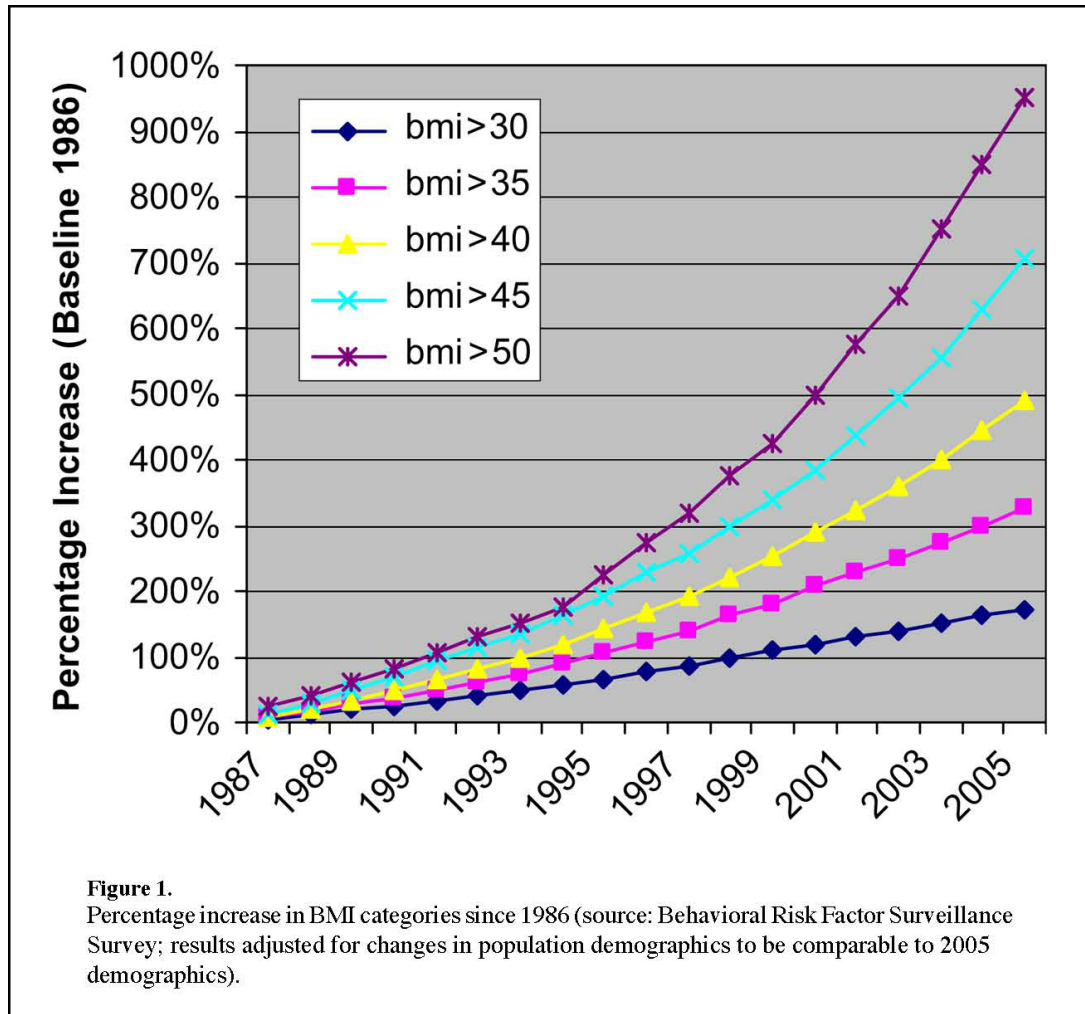


Table 3: A Comparison of DPP and Look AHEAD with the AHH/ACC/TOS guidelines and SCT key constructs

Intervention Component	AHH/ACC/TOS Guideline or SCT Construct	DPP	Look AHEAD
Weight loss goal (rate)	5 – 10% 8 kgs.	7% or 0.45 – 0.9 kg/wk.	≥ 10% or
Calorie goals	individualized	individualized	Semi-individualized
Physical activity goals	≥ 150 minutes/wk.	≥ 150 minutes/wk.	≥ 175 minutes/wk.
Program duration	6 months (min)	6+ months	6+ months
Format of contacts	no guidelines	individual face-to-face	group face-to-face plus individual
Number of contacts (first 6 months)	14 (min)	16 core sessions	24
Self-monitoring	Regular self-monitoring of diet, physical activity and weight	daily fat and calorie intake, physical activity in minutes/day and weight	included but what components were monitored is unclear calorie intake, physical activity and weight
Program Incentives	no guidelines	\$100 per participant per year	yes, but only part of advanced toolbox options
SCT Constructs			
Environment		✓	✓
Situation		✓	✓
Behavioral Capability		✓	✓
Self-control		✓	✓
Observational Learning		✓	✓
Reinforcements		✓	✓
Self-efficacy		✓	✓
Emotional Coping Responses		✓	✓

Table 4: Selected SCT constructs with definitions and intervention implications.<sup>171</sup>

Construct	Definition	Implications
Environment	Factors physically external to the person	<i>Provide opportunities and social support</i>
Situation	Person's perception of the environment	<i>Correct misperceptions and promote healthful norms</i>
Behavioral Capability	Knowledge and skill to perform a given behavior	<i>Promote mastery learning through skills training</i>
Self-Control	Personal regulation of goaldirected behavior and performance	<i>Provide opportunities for decision making, self-monitoring, goal setting, problem solving and selfreward</i>
Observational Learning	Behavioral acquisition that occurs by watching the actions and outcomes of others' behavior	<i>Include credible role models of the targeted behavior</i>
Reinforcements	Responses to a person's behavior that increase or decrease the likelihood of reoccurrence	<i>Promote selfinitiated rewards and incentives</i>
Self-efficacy	The person's confidence in performing a particular behavior and overcoming barriers to that behavior	<i>Approach behavior change in small steps to ensure success; seek specificity about the change sought</i>
Emotional Coping Responses	Strategies or tactics that are used by a person to deal with emotional stimuli	<i>Provide training in problem solving and stress management; include opportunities to practice skills in emotionally arousing situations.</i>

Table 5: A selection of characteristics of three BWL programs designed for severely obese populations

	Goodpaster et al. 2010	Samaha et al. 2003	Ryan et al. 2010
Sample Size	n = 130	n = 132	n = 465
% African American	37%	58.5%	24%
% Female	88%	17.5%	83.5%
Average Age	46.8 yrs.	53.5 yrs.	47 yrs.
Average BMI	43.6 kg/m <sup>2</sup>	42.9 kg/m <sup>2</sup>	46.1 kg/m <sup>2</sup>
Contact <i>Number</i>	24 (group & individual)	9 (group only)	20 (group & individual)
Contact – <i>Type</i>	Group & Individual	Group	Group & Individual
Contact – <i>Mode</i>	F2F	F2F	F2F
Contact <i>Frequency</i>	Weekly	Weekly then Monthly	Weekly then Bi-Weekly & Monthly
Intervention Duration	24 wks.	24 wks.	52 wks.
Estimated Dose	Unable to estimate	23 hrs.	16 hrs.
Dietary Approach	1200 – 2100 kcals/day Pharmacotherapy: Not Reported Meal Replacements: Yes	caloric restriction of 500 kcals/day, nutrition education Pharmacotherapy: Not Reported Meal Replacements: Not Reported	VLCD & structured meal plan Pharmacotherapy: Yes Meal Replacements: Yes
Physical Activity Approach	MVPA, 60 min for 5 days/wk., pedometer, exercise videos, small financial incentives for adherence to recommendations	no specific exercise Rx was recommended	instruction in physical activity and physical activity recs (although not specified)
Attrition	10%	42%	30-69% (by site)
Attendance	75.1%	83%	NR
Statistical Analysis	ITT <sup>1</sup>	ITT	Completers Analysis
Absolute Weight Loss	10.9 kg <i>in 6 months</i>	1.9 kg <i>in 6 months</i>	13.1 kg <i>in 52 weeks</i>
% Weight Loss	9%	1.45%	10.3%

<sup>1</sup> Intention To Treat



## **CHAPTER IV: A MIXED METHODS INVESTIGATION OF CONTEXTUAL STRESS EXPERIENCES AND ASSOCIATED COPING BEHAVIORS IN AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE**

### **IV.A. Overview**

Severe or class III obesity ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) is associated with significantly higher risk of developing heart disease, diabetes, stroke and cancer.<sup>128</sup> The number of individuals who are severely obese in the US is growing at twice the rate of the obese population (classes I and II,  $\text{BMI} 30 - 39.9 \text{ kg/m}^2$ ) and there are clear disparities across races/ethnicities.<sup>1</sup> In 2010 African American women were more than twice as likely to be severely obese than their Caucasian counterparts (18% vs. 8%).<sup>132</sup> There is mounting evidence that supports the role of stress as a significant contributor to the development of these weight-related disparities.<sup>56,184,185</sup>

The purpose of this study was to better understand the potential role of stress—specifically, the two culturally informed sources of stress, Role Overload (RO) and the Superwoman Role (SR) on weight-related behaviors in African American women who are severely obese. These questions were addressed with a mixed-methods research approach that incorporated questionnaires and focus groups. Nineteen ( $n = 19$ ) women were recruited from two counties in North Carolina and invited across a total of 5 focus groups. All sessions were digitally recorded and transcribed verbatim. Directed content analysis guided our development of a codebook, which was used as a guide in the analysis of the transcripts.

Participants (mean age = 46.6 years, 15.3 years of education, 58.8% working full-time and 55.6% with household incomes of \$39K or less) reported top sources of stress were: caregiving

responsibilities (namely for children, grandchildren and aging parents), work and finances. The RO theme was prominent in the discussion of the caregiving responsibilities. An overwhelming majority of participants felt that stress (including stress associated with RO and the SR) was related to body weight. Participants felt that stress contributed to weight through (1) the quantity and quality of food consumed during stressful times, (2) feeling depressed and having no motivation to engage in healthy lifestyle behaviors and (3) fatigue (“you’re just tired”). Although, some women were reluctant to ask for support, others described how they felt that asking for support did not jeopardize their persona of “strength” and went on to provide specific examples from their own lives. The contextual stressors RO and SR are relevant constructs to understanding weight-related health behaviors among African American women who are severely obese. Future research should seek answers to questions on how to effectively tailor BWL interventions to address these contextual challenges.

#### **IV.B. Introduction**

“Severe” or “Class III” obesity is defined as having a BMI greater than or equal to 40 kg/m<sup>2</sup>. This excess weight puts severely obese populations at significantly higher risk of a chronic disease.<sup>128</sup> Based on 2010 data, the number of individuals who are severely obese in the US is growing at *twice* the rate of the obese population (those with a BMI between 30 kg/m<sup>2</sup> and 39.9 kg/m<sup>2</sup>, Classes I and II).<sup>1</sup> Prevalence rates of severe obesity (18.0%) in African American women are substantially higher than their Caucasian female counterparts (7.3%) and African American male counterparts (7.6%).<sup>1,186</sup>

One of the most robust, salient and well-studied themes in the African American weight-disparity literature is “stress”,<sup>6,55,185,187-190</sup> but less is known about the specific role of stress in severe obesity. The impact of stress on physical health (among many other determinants)

operates through multiple factors including how the individual perceives stress. Perception can then impact how they will (behaviorally) cope with the stress. The effectiveness of the coping response often determines how the body will (physiologically) respond. When coping responses are ineffective, the hormonal feedback loops that regulate the stress-response pathways are disrupted, which can lead to excess fat accumulation, particularly in the abdomen.<sup>48-51</sup> Previous studies with African American women have shown that race and gender can play a role in: characterizing the types of stressors they will be exposed to, shape the way they perceive these stressors and finally, determine how they will respond to those stressors – whether out of choice or necessity.

Several recent publications attest to both the high amount and unique sources of stress in the lives of African Americans, especially African American women.<sup>6,34,191</sup> Although African American women face many significant and unique stressors, the concept of RO is especially prominent. In their 1985 publication Barnett et al. coined the term RO, which they define as having so many role demands or obligations that the individual feels unable to perform them all adequately.<sup>53</sup> Many historical, social and cultural factors that are unique to African American women contribute to the high risk of experiencing RO-related stress. Included among them are (1) the embodiment of the MCR, (2) low levels of social support and (3) low socioeconomic status.<sup>54</sup>

In a qualitative study with southern, mostly rural African American women with diabetes, Samuel-Hodge et al. (2000) coined the term “multiple caregiver role” (MCR) to “describe the feeling of responsibility for providing emotional and/or tangible aid to extended family members and friends”.<sup>54</sup> The seventy women in 10 focus groups included in the Samuel-Hodge study went on to describe how this role was a significant source of stress in their lives and often left them

physically and mentally tired, which, in turn, impacted their ability to successfully manage their diabetes. There are many reasons why African American women are subject to embodying the MCR. Some women report that assuming the MCR meant having the ability to wear many hats (e.g. wife, mother, second mother, cook, household manager, worker outside the home, chauffeur, church member, caregiver and confidante), which gave them a sense of purpose, independence and control and most importantly, confirmed their identification as strong Black women.<sup>56,58</sup> However, sometimes, African American women embody this role out of a feeling of obligation or as a result of having difficulties in saying “no” or due to fears that if they focused too much on themselves (as opposed to serving the needs of others) they will be viewed as “weak” by other African American women.<sup>59</sup>

Cultural expectations and norms play a significant role in how African American women cope with the chronic stressor, RO. The Superwoman Role (SR) developed out of a necessity to survive and has been shaped by a long history of racism, disenfranchisement and oppression, which forced these women to take on multiple roles including wife, mother, provider, etc.<sup>56</sup> Being a “superwoman” is a role that is reinforced by community perceptions/ideas/values that Black women do not get depressed and they do not need assistance to manage their life struggles.<sup>59</sup> Woods-Giscombe et al. (2010) conducted focus groups with a diverse sample of 48 African American women living in the southeastern United States in order to explore the benefits and liabilities of this role and how this cultural concept influences overall well-being.<sup>56</sup> From her work, five inter-related characteristics emerged that are relevant to how African American women cope with RO including the following: (1) an obligation to manifest strength, (2) an obligation to suppress emotions, (3) resistance to being vulnerable or dependent, (4) determination to succeed despite limited resources and (5) obligation to help others. In this same

publication Giscombe et al. suggest that one of the implications for their future research may be to investigate how the SR may contribute to the weight disparities in African American women, especially African American women who are severely obese. The purpose of our formative research is to both confirm and expand the scope of the previous research done by Samuel-Hodge, Woods-Giscombe and others by exploring views the contextually defined chronic stressors—RO and SR—and their relationship to health behaviors in a specific population of African American women. We addressed these questions through a mixed-methods approach using questionnaires and focus groups.

#### **IV.C. Methods**

##### *Participant Recruitment*

Participants were recruited from two communities in North Carolina (one relatively urban and one rural). Participants from the urban setting were recruited by using research registries such as Research Match ([www.ResearchMatch.org](http://www.ResearchMatch.org)), university listservs, as well as advertising through several community contacts. The participants from the rural setting were taking part in a larger cardiovascular disease prevention project; full details of this study are published elsewhere.<sup>192,193</sup> We used baseline demographic information from the study participants to identify potentially eligible women; a study recruitment letter was mailed to all women who met the inclusion criteria. All recruitment materials—emails, letters, etc.—included instructions on how to access an online screening questionnaire to determine eligibility to participate in the study. The University of North Carolina Institutional Review Board (UNC-IRB) approved protocols for recruitment and conduct of all study activities.

## *Questionnaire*

After indicating their consent, participants were asked to complete a questionnaire that contained questions concerning demographics, diet and exercise habits, stress levels, mood and attitudes/beliefs regarding African American female stereotypes. The questionnaire could be completed either online (via Qualtrics, [www.qualtrics.com](http://www.qualtrics.com)) or using a paper and pencil version (mailed to the participant). The questionnaire contained approximately 200 questions (depending on skip patterns) and took approximately 1 hour to complete. The following variables were assessed as part of the questionnaire. See Appendix VII for full details on measurement tools used in the questionnaire.

### DEPRESSION

Symptoms of depression were assessed via the 20-item Center for Epidemiologic Studies Depression Scale (CES-DS).<sup>194</sup> Scores can range from 0 – 60; scores ranging from 15 to 21 indicate mild to moderate symptoms of depression and scores > 21 suggest the presence of severe/clinical depression. The CES-DS has been shown to have high internal consistency ( $\alpha = 0.84 - 0.90$ ) and, as evidenced by a confirmatory factor analysis study ( $n = 521$ ), has been demonstrated to be an appropriate measurement tool used to measure depressive symptoms in African American women.<sup>195</sup>

### STRESS

Stress levels were measured using two instruments. The first instrument, the Perceived Stress Questionnaire (PSQ),<sup>196</sup> is a 30-item self-administered questionnaire with high internal consistency ( $\alpha = > 0.90$ ) that assesses the respondent's appraisal of life events in the previous month. Respondents are asked to reply to all items using a 4-point likert-type scale. Specifically, questions address how often a person has experienced negative emotions or feelings like

harassment, overload, irritability, lack of joy, fatigue, worry or tension. The index ranges from 0.0 – 1.0 with higher scores being associated with higher levels of stress.

The Gender-Related Stress Scale (GRSS)<sup>34,197</sup> is more race and gender specific. The GRSS was used to measure chronic stress exposure within the past year. The tool consists of 43 questions and is designed to measure the perception of the stressor by the participant using perceived impact ratings.

#### MULTIPLE CAREGIVING ROLE

The Multiple Caregiving Measurement Instrument (MCMI) developed by Samuel-Hodge et al. (2005)<sup>198</sup> ( $\alpha = 0.72 - 0.76$ , *by subscale*) was used to assess barriers to engaging in healthy behaviors associated with the multiple-caregiver role. The full instrument consists of 10 questions using a 4-point likert-type rating scale ranging from “disagree a little” to “agree a lot”. Results from the full instrument can be reported as two sub-scores. The first score (7 questions, possible score range 6-24) captures the degree to which the respondent identifies with common characteristics of the MCR. The second score (3 questions possible score range 3-24) assesses barriers associated with the MCR. Our questionnaire only included the 3 questions assessing barriers.

#### THE SUPERWOMAN ROLE

An 11-item selection (of 34 total questions) of the Stereotypic Roles for Black Women Scale (SRBWS) developed by Thomas et al. (2004)<sup>199</sup> was used to assess how much respondents relate with stereotypical behaviors associated by the SR. Participants were asked how much they agree or disagree with a series of statements using a 5-item likert scale ranging from “strongly disagree” to “strongly agree”. Examples of statements from the “Superwoman” subscale include “Black women have to be strong to survive” and “If I fall apart, I will be a failure”.

## USING FOOD TO COPE

The use of unhealthy eating behaviors as a coping response to stress was measured using the 7-item GiscombeWoods “Using Food to Cope Scale” (UFTCS).<sup>187</sup> This measure is not designed to assess more severe, pathological eating behaviors such as binge eating, but rather to capture the more commonplace, stress coping responses involving food. Examples of behaviors captured in this scale include: treating yourself to comfort foods to relieve stress; eating in the absence of hunger; and eating prepared foods due to perceived lack of time to cook. The tool assesses the frequency of specific behaviors over the past month using a 5-point likert scale. The scale has been demonstrated to have good internal reliability among adult African American women ( $\alpha = 0.82$ ) as well as adult African American men and women with pre-diabetes ( $\alpha = 0.82$ ).

## BINGE EATING DISORDER

Symptoms of BED were assessed using the Binge Eating Scale (BES),<sup>98</sup> a 16-item self-administered questionnaire that assesses the severity of BED symptoms. Gormally et al. (1982) found the scale to have high internal consistency (as measured through a chi-squared test for significance, all 16 items  $> 9.1$ ,  $p < 0.01$ ). The BES has also shown to have high internal consistency in bariatric surgery patients ( $\alpha = 0.87$ .<sup>200</sup>) and in obese women ( $\alpha = 0.89$ .<sup>201</sup>). Scores between 18 and 26 suggest the presence of moderate bingeing behavior and scores greater than 27 may be an indication of severe/clinical binge eating.

## NIGHT EATING SYNDROME

Symptoms of NES were assessed using the Night Eating Questionnaire (NEQ) developed by Allison et al. (2008).<sup>202</sup> The NEQ is a 17-item, self-administered likert-type scale with acceptable internal consistency ( $\alpha = 0.70$ ) among bariatric surgery patients.<sup>202</sup> and has been used



in studies with African American women.<sup>203</sup> Scores can range between 0 – 52 with scores  $\geq 25$  being “suggestive of NES” and scores  $\geq 30$  being a “strong indicator” of the presence of NES.

#### SOCIAL SUPPORT FOR DIET AND EXERCISE

The Sallis Social Support Surveys for Diet (SS-D) and Exercise (SS-E) Behaviors<sup>204</sup> are widely-used 23-item, self-administered questionnaires with acceptable internal consistency ( $\alpha = 0.80 - 0.87$  (friend support for diet, by subscale),  $\alpha = 0.83 - 0.87$  (family support for diet, by subscale),  $\alpha = 0.84$  (friend support for exercise),  $\alpha = 0.61 - 0.91$  (family support for exercise, by subscale)). The surveys have been used in several studies with African American women.<sup>205-207</sup>

#### *Focus Groups*

To be eligible to participate in the focus group, women must have self-identified as Black or African American and had a BMI equal to or greater than 40 kg/m<sup>2</sup> (based on self-report height and weight). Study staff contacted women who were deemed eligible based on the above inclusion criteria. Participant consent was obtained using an online form and electronic signature. After providing consent participants were sent a link to the questionnaire described above (or mailed a paper copy) and asked to complete it before their focus group meeting. We conducted five 90-minute focus groups with a total of 19 participants. A review of the literature and consultation with experts on the topic informed the development of the discussion guide. The questions in the guide asked participants to explain their views on the culturally informed sources of stress (RO and SR) with a specific focus on how these experiences and behaviors might impact their ability to maintain a healthy body weight. An experienced female African American moderator led all focus group sessions. Each participant received a \$25 gift card for completing the questionnaire and an additional \$25 gift card for taking part in the focus group (total potential incentive per participant was \$50).

## *Data Analysis*

### QUESTIONNAIRE

Descriptive statistics were calculated for both the demographic and psychosocial variables. We performed exploratory analyses using Pearson product moment correlations to describe relationships among the psychosocial variables. Data were analyzed using SAS version 9.3 (SAS Institute, Cary, NC). The significance level was set at 0.05 and all p-values are two-sided.

### FOCUS GROUPS

We selected a phenomenological research design approach to examine the views of African American women who are severely obese on the MCR and SR in relation to engaging in healthy lifestyle behaviors. Focus groups were chosen as the methodological approach primarily because they allow group members to build upon one another's responses thereby expanding the breadth and depth of the topics discussed. To enhance the credibility of our findings we used a triangulation strategy, incorporating multiple methods (focus groups and the questionnaire, described above) and multiple researchers (multiple reviewers—all women, southerners, both African American and Caucasian and all with experience in weight loss research—for all transcripts).

Our study used a directed content analysis approach. We used the key constructs of the MCR as described by Samuel-Hodge et al.<sup>198</sup> and the SR as described by Woods-Giscombe et al.<sup>56</sup> to develop our codebook. Any text that could not be categorized was given a new code. The codebook was developed by one of the authors (DB) with feedback from a selection of the coauthors and included operational definitions. All focus group sessions were audio-recorded and transcribed verbatim. Transcripts were reviewed and coded using Atlas.ti (Scientific

Software Development, Berlin) by at least two members of the research team; all transcripts were reviewed by at least 1 African American member of the team. After all data had been analyzed the team shared their findings and resolved any discrepancies regarding coded text and overall interpretation of codes (themes).

#### **IV.D. Results**

##### *Participants*

A total of 5 focus groups were held with 19 women; 3 sessions with 6 total women in the urban location and 2 sessions with 13 total women in the rural location with 19 women. All of the women who took part in the focus groups completed the questionnaire except one. Participants reported an average age of 46.6 years and 15.3 years of education. Almost half (44.5%) of the participants had never been married. The majority (58.8%) of women were working full-time and had a household income (55.6%) less than \$39K per year. See Table 6 for demographic information.

##### *Questionnaires*

Raw scores (including the mean, median, standard deviation, minimum and maximum) for the variables assessed on the questionnaire can be found in Table 7. CES-DS scores can range from 0 – 60 with lower scores signifying lower levels of depression. The average score for our sample of women was 19.8 ( $\pm$  8.8), which falls into the range for mild to moderate levels of depression (15 – 21).

Possible scores for the PSQ range from 0.0 – 1.0 with Low Scores indicating lower stress levels. The mean score for our sample was 0.46 ( $\pm$  0.2, 46<sup>th</sup> percentile). The GRSS assesses whether the respondent has experienced any of the 31 culturally-defined stressful life events within the past year and then asks for an “undesirability rating”, which ranges from 1 (not at all

undesirable/negative) to 4 (very much undesirable/negative) for each stressful life event.

Participants reported experiencing, on average, about 6 stressful life events (average rating 2.6) over the past 12 months. The most commonly reported stressful life events were: feeling expected to be strong while no one is strong for you (62.5% mean rating = 2.8), experiencing unusual financial pressures or trouble with money (62.5%, mean rating = 3.4) and losing a loved one (49.6%, mean rating = 3.4).

The average MCMI score was 5.5 ( $\pm 3.2$ , 12<sup>th</sup> percentile). Scores on the SR subscale of the SRBW questionnaire were, on average, in the 64<sup>th</sup> percentile (39.1,  $\pm 9.0$ ). The mean total score UFTCS score ( $\Sigma$  of the score for each question) for our sample was 13.9 ( $\pm 4.7$ , 46<sup>th</sup> percentile). The most frequently reported food coping behaviors was “eating beyond the point of fullness because the food was so satisfying” (2.7,  $\pm 0.75$ ). The least common food coping behavior in our sample of women was “eating breads, chips, chocolates or sweets” (1.5,  $\pm 0.92$ ).

Approximately 20% ( $n = 3$ ) of the women in our study had scores on the BES ( $\geq 18$ ) that suggested moderate to severe binge eating behaviors. Results on the NEQ were similar to the BES. Approximately 17% ( $n = 3$ ) of women had scores that suggested the presence of NES ( $\geq 25$ ). SS-D scores ( $62.1 \pm 6.2$ , 50<sup>th</sup> percentile) were much higher than SS-E scores ( $47.7 \pm 13.6$ , 27<sup>th</sup> percentile). The SS-E scores in our sample were similar those found in another study with African American women ( $46.3 \pm 11.3$ ).<sup>208</sup>

Pearson product correlations between the questionnaire component or scale scores and BMI are found in Table 8. Higher scores on the MCMI and the SRBW scales were associated with lower BMI (negative association) (MCMI and BMI 0.54,  $p = 0.04$ ; SRBWS and BMI 0.72,  $p < 0.01$ ) but positively associated with two of the food coping behaviors BES (MCMI 0.68,  $p < 0.01$ ; SRBWS 0.54,  $p = 0.04$ ), NEQ (MCMI 0.55,  $p < 0.01$ ; SRBWS 0.66,  $p = 0.018$ ) and with

depression (MCMI and CES-DS 0.51,  $p = 0.04$ ; SRBWS and CES-DS 0.60,  $p = 0.01$ ).

Depression was also significantly associated with both stress measures (CES-DS and PSQ, 0.93,  $p < 0.01$ ; CES-DS and GRSS, 0.83,  $p < 0.01$ ). All three disordered eating scales (BES, NEQ and UFTCS) were highly and significantly associated with one another (UFTCS and BES, 0.62,  $p = 0.014$ ; UFTCS and NEQ, 0.50,  $p = 0.03$ ; BES and NEQ, 0.74,  $p < 0.01$ ). These same three scales were associated with perceived stress (PSQ and BES, 0.61,  $p = 0.02$ ; PSQ and NEQ, 0.71,  $p < 0.01$ ; PSQ and FTC, 0.71,  $p < 0.01$ ) and depression (CES-DS and BES, 0.75,  $p < 0.01$ ; CES-DS and NEQ, 0.78,  $p < 0.01$ ; CES-DS and FTC, 0.54,  $p = 0.02$ ).

### *Focus Groups*

#### ROLE OVERLOAD

Many women described stress that resulted from the breakdown of the nuclear family structure, primarily the lack of a father figure. They discussed this scenario in reference to their past lives (childhood experiences), current life and in the lives of others. Many women talked about taking on the responsibility of caring for grandchildren and in some cases where their children had moved back in with them, bringing along grandchildren.

With me, it's um, my grandchildren. And sometimes their parents' time and my time coincides. So, um, I know that they can't get off work until it's time for them to get off. My son, he drives trucks, and sometimes he has breakdowns, or, um, so sometimes he's usually the first one to come in but sometimes I need that time that they could be in at least by five o'clock. Sometimes I end up babysitting from eight-thirty in the morning until six o'clock. And sometimes that gets a little stressful. I love my grandkids, but sometimes, you know, I'd rather have some time for me.

Participants felt that RO and the MCR were cultural phenomena. A frequently discussed theme was "being raised to be nurturers" from a young age. Women described learning these cultural norms through indirect methods, like observing their mothers and grandmothers, as well as through more direct experiences.

And I remember when I was a kid my grandmother would always say, you know, there were four of us, three...me and my three sisters and she'd always say "If you have a slice of bread, and your siblings are hungry then you need to take that slice of bread and, you know put it in four, you know...so everyone has something to eat"...and that kind of stuck with me as far as, I am my brothers keeper you know [INAUDIBLE] the church and everything but you know really being taught that I am...I am responsible for other people in my group, and so that um, that means that if I miss out on something for myself then that's fine because I've taken care of somebody else so I just really adopted that idea and didn't even know I had adopted it until...nervous breakdown

Lack of fiscal resources and the stress associated with this situation was cited by many of the focus group participants. One participant describes her financial-related stress in terms of the instability that it causes in her life:

Mine have been finances, definitely finding a job I really want to do which is also connected to finances um, doing work, um not only that I want to do but feel like I could be successful at doing [INAUDIBLE] just the instability that's associated with my life right now [PAUSE] financially unstable, housing instability...job instability...all of those things...those are my major stressors

Lack of social support for healthy eating behaviors from family members—both nuclear and extended—was a prominent topic in all of the focus group discussions. Spouses and children were unsupportive primarily through their unwillingness to engage in healthy lifestyle habits—e.g. not willing to consume healthy foods or engage in physical activity. With extended family members—parents, grandparents, aunts, uncles, etc.—the lack of support was commonly expressed verbally. The temperament of the unsupportive comments ranged from confirming (e.g. "Well, your size is fine!") to passive-aggressive ("now you got that tall goodlookin' boyfriend you better get it together") to potentially offensive ("everybody would get over there to eat you know but then they'll talk about "well, oh" you're gaining weight and you done got so fat").

#### IDENTIFICATION WITH CHARACTERISTICS OF THE SR

The majority of African American women who are severely obese in our focus group

sessions seemed to agree with the characteristics of the SR that are described by

GiscombeWoods et al. (2010).<sup>56</sup> One woman described how the SR was considered “the norm” and when that cultural norm was broken she didn’t know how to respond.

...and so when you’re outside of that norm...it’s...um...frightening. I just feel like it’s frightening for...you know...even with my sister...sisters...I don’t expect them...I say I don’t expect them to be superwomen...but when they’re not...I’m like ..”oh! what happened?”...you know...”how did this happen to you?”...what do you need me to do I’m just so...it frightens me that they’re not superwomen.

Discussions frequently focused on the SR characteristics related to obligations to manifest strength and help others. These discussions commonly included mention of the liabilities of the SR including psychological consequences of stress (depression) the stress-related health behavior, emotional eating.

I think, um, as adult women we weren’t taught, um, self-care. We were taught not to be selfish. Um, we were, as females we were bred to be nurturers. From the time we got that first baby doll, and the little brooms and vacuums, and all them other things we got, um, we were taught that um, with guilt as the motivator, that to be a good person, or good girl, you take care of people and things. Um, and in a sense we pride ourselves in it. And that superwoman cape, um, is choking us. It’s choking us. Even though we’re stuffing everything in our mouths that we can get our hands-on, it’s choking us. Um, and it’s killing us. Um, we are excellent at being supporters, but have yet to find the words to consistently ask for nurturing until it gets to the point that, um, it has to be triaged.

Participants felt that stress did affect their body weight. Although they described stress relating to body weight more by quality of food (“comfort” food) than the quantity, some participants did describe their stress-coping responses as “food addictions”, “binge eating” and “emotional eating”. Women described seeking comfort in highly palatable—e.g. high fat, high sugar and high salt—foods during times of stress. Feelings of depression associated with higher stress levels were also mentioned. Specifically, participants described how the lack of motivation and fatigue—attributed to both psychological and physiological sources—made preparing healthy meals and engaging in regular physical activity burdensome.

Resistance to being vulnerable or dependent was a theme that was mentioned by some participants.

I know it's not right because there are times...somebody say...you want something to eat? "no" and I'm starving! [POLITE LAUGHTER]...but it's just like...I don't want you to know I'm hungry...I don't want you to know there's a lack there...no. mmm.mmm. that's how bad it would be. Sometimes I know would be so tired with the kids but I wouldn't ask for help. These are your kids. You've gotta do it. Tough it out.

However, asking for support was not totally off-limits. Several women across the 5 focus group sessions described how they had successfully obtained the support they needed.

...so once I started taking me time whether...it started out with a book club, the more involved I got in church with my core group of girlfriends I was like, oh, I don't feel too bad now [group laughter] my family is gonna be alright, you see [pause] you've got to have me time, they're gonna be alright the house is still up no ambulance has shown up, nobody's gone to the hospital, I'm like ok...

In fact, one women described how she felt that asking for support did not jeopardize the image of "strength".

Because asking for help or having help or a support group doesn't mean I'm still not who I am. That doesn't take away from my strength any. If anything it strengthens it. It strengthens it. It allows me a comfortable place or a safe place to break down.

#### **IV.E. Discussion and Conclusions**

In our sample, we found that severely obese African American identified with both of the contextually defined stressors—*RO* and *SR*. During the focus groups, barriers related to embodying the *MCR* and the *SR* were frequently described as a source of stress; this finding was supported through the questionnaire data showing a significant association between perceived stress and identification with barriers related to the *MCR* and *SR* characteristics. Women in all five sessions described engaging in emotional eating in response to stress. Results from the questionnaire found that symptoms of both *NED* and *BED* were significantly and positively associated with perceived stress, *MCR* barriers and *SR* characteristics.



Emotional eating in response to stress—including contextual stress—was frequently described by women during the focus group sessions. This finding was supported by data collected from the questionnaire that indicated there was a significant and positive relationship between identification with the MCR barriers and SR characteristics with stress and with food coping behaviors. However, contrary to our hypothesis, the questionnaire data also revealed that identifying with the contextual stressor of MCR or SR was associated with lower BMI within Class III. The reasons for this finding remain unclear but may be tied to reporting bias in a manner that is similar to the association between increasing BMI and being more likely to under-report weight and over-report height.<sup>209</sup>

In our sample of African American women who are severely obese all three disordered eating scales (BES, NEQ and UFTCS) were highly and significantly associated with perceived stress (PSQ). Emotional eating was a commonly cited stress coping behavior across all five focus groups. Focus group participants described their emotional eating behaviors in terms of both the nutritional quality of foods they consumed—typically characterized by high amounts of sugar, fat and/or salt—as well as the quantity. The strong association between increased stress levels and increased preference for and consumption of high fat foods is supported by other studies with animals<sup>39</sup> and women,<sup>111,112,113</sup> including African American women.<sup>88</sup> Epel et al. (2000) attest that there are biological explanations for our preferences for both carbohydrate and fat during times of stress. Their studies with animals found that adrenal steroids influence macronutrient selection by increasing appetite for these two nutrients.<sup>51</sup>

Consuming highly palatable (e.g. highly sweetened or salted), energy-dense foods as a frequent response to stress can easily and quickly tip the body's energy balance in favor of weight gain. A 2015 study with female African American college students (n = 104)

demonstrates this phenomenon. The authors report that perceived stress was positively and significantly associated with emotional eating ( $0.35 p < 0.01$ ) and that emotional eating moderated the relationship between stress and BMI.<sup>210</sup> The differences in demographics of the two samples may help to explain these contradictory findings. The women in the Diggins et al. study were considerably younger (19.4 years) and had lower BMIs ( $26.8 \text{ kg/m}^2$ ). Research indicates that individuals who are severely obese frequently under-report energy intake, especially if they are depressed.<sup>211</sup> Therefore, it is reasonable to hypothesize that individuals who are severely obese may also be apprehensive about reporting food coping behaviors such as those that would be captured by the BES, NEQ and UFTCS.

At least two focus group participants described their food coping behaviors as “a binge” or “bingeing” and 3 (20%) of questionnaire respondents had BES scores that indicate the presence of moderate to severe binge eating. Binge eating behaviors have been associated with stress in other studies with African American women. Harrington et al. (2010) found that greater levels of distress among African American women were positively associated with “more emotional inhibition/regulation difficulties, eating for psychological reasons, and ultimately binge eating”.<sup>95</sup> A 1994 study reporting on the results of 600 Essence magazine readers found that 38% of respondents report experiencing “Eating binges I can’t stop.”<sup>94</sup> While eating disorders, including BED, were once thought to be rare among ethnic minorities, recent studies are calling into question the accuracy of those beliefs. A population-based, cross-sectional study in the San Francisco area found that prevalence of BED was 5% in African American women compared to 2% in Caucasian, although the differences were not statistically significant.<sup>86</sup> An analysis of data from the National Institute of Mental Health, Collaborative Psychiatric

Epidemiological Study found that lifetime binge eating behavior prevalence rates were higher in African American women (5.6%) than Caucasian women (3.1%).<sup>212</sup>

In our sample of African American women who are severely obese, depression was highly and significantly associated with both stress measures (CES-DS and PSQ, 0.93,  $p < 0.01$ ; CES-DS and GRSS, 0.83,  $p < 0.01$ ). It is possible that embodying characteristics of the SR may increase the risk of depression. As previously described, one of the core characteristics of the SR role as identified by Giscombe et al. (2010) is an obligation to suppress emotions. This “silencing paradigm” as described by Jack (1991) can increase the risk of depression as a result of women being socialized to believe that their acceptance in their community and personal well-being are dependent upon their embodiment of certain values.<sup>80</sup> This is troublesome since African American women are already at higher risk for depression due to their higher risk of poverty, unemployment, low-educational attainment and single parenthood.<sup>81,82</sup> Unfortunately, depression is viewed by many Black women as a “White illness” and is seen as a sign of weakness and considered “intolerable” further incentivizing suppression of these feelings instead of reaching out to others for support.<sup>59</sup> During the focus group discussions, participants described how they associated their depression symptoms with fatigue and reduced motivation to engage in healthy lifestyle behaviors.

Data collected from the GRSS indicated that the 4<sup>th</sup> most commonly experienced negative life event was “had difficulty finding a date for extended period of time (when one was desired)”. This was cited by 43% of respondents and given an impact rating of 3.3 (similar to the rating that was given to financial struggles and the loss of a loved one). Thirty five percent had never been married and 26% were divorced. Prior research has established clear relationships between loneliness and several health outcomes. A study by Segrin et al. (2010) found that<sup>213</sup>

loneliness mediated the association between social support and health. The construct of loneliness is often studied in the context of health and health behaviors in older adults but our findings suggest that it may be a relevant domain to study in other populations.

Characteristics of the SR can have a deleterious impact body weight. Because “superwomen” seek to maintain an image of strength, they may be reluctant to accept support because it threatens their perception of themselves as strong and independent.<sup>58</sup> In a series of focus groups that sought answers to questions that would help deepen our understanding of the role of social support in diabetes management, African American women reported that they felt their family members’ attempts to provide support threatened their self-perceptions of being strong, Black, independent women, which resulted in feelings of powerlessness. There is a broad and relatively robust literature supporting the important and positive role that social support can play in health behaviors among African Americans including diet and physical activity<sup>60-63</sup>, which are key components of a BWL program. But there is also evidence to the contrary with several cross sectional studies in mixed-race populations finding no relationship between social support and body weight.<sup>214-216</sup>

### *Strengths and Weaknesses*

This study has both strengths and limitations that warrant mentioning. The major strengths of our study include focusing on a relatively understudied but high-risk population. In addition, our sample included women from both an urban and rural setting. The most significant limitation is the potential bias that comes from using a small convenience sample; caution must be taken in generalizing the findings to other African American.

### *Implications for Future Research and Practice*

Using culturally competent approaches when designing interventions or treating patients

is clearly warranted by the many published studies on this subject matter. However, there is relatively little information available to researchers and practitioners on how to translate this information into culturally relevant practices. Much more research is needed to test the translation of this knowledge into intervention programs. More specifically, we need to understand how to bridge the communication gaps that may result from differences in race, gender and even body size. Matching patients or participants with providers or researchers with similar characteristics is not always feasible. Social support remains a difficult construct to conceptualize and measure and seems to vary not only by race, gender and age but also by the type of health behavior in question. Despite these challenges social support remains an important topic to study with regards to health behaviors. In his recent publication in *Ethnicity and Disease*, William Wolfe calls for more research specifically in the area of social support for weight management in African American women noting that social support can enhance perceived control/self-efficacy.<sup>217</sup> Future research should continue to examine this construct with a focus on understanding how race, gender and the quality of the relationships may modify the efficacy.

Table 6: Focus group participant demographics

Characteristics (n = 18)	
Demographics	
Age, years	46.6
Educational achievement, years	15.3 (2.8)
Marital Status, No (%)	
<i>Married</i>	5 (27.8)
<i>Widowed</i>	1 (5.6)
<i>Divorced</i>	4 (22.2)
<i>Separated</i>	0
<i>Never Married</i>	8 (44.5)
<i>Living With Partner</i>	0
Smoked 100+ Cigarettes (“No”), No (%)	15 (83.3)
Employment Status, No (%)	
<i>Working FullTime (<math>\geq 30</math> hours)</i>	10 (58.8)
<i>Working PartTime (<math>&lt; 30</math> hours)</i>	2 (11.8)
<i>Student</i>	1 (5.9)
<i>Not Working Due to Health Reasons</i>	2 (11.8)
<i>Retired</i>	2 (11.8)
Annual Household Income, No (%)	
$\leq \$19K$	5 (27.8)
$\$20K \$39K$	5 (27.8)
$\$40K \$69K$	6 (33.3)
$\geq \$70K$	0
Number of Children Living in Household	0.53 (0.7)

Table 7: Focus group participant psychosocial variable scores

Score [possible range]	n	Mean	Median	SD	Min	Max
CES-DS [0 – 60]	17	20.0	18.0	9.0	11	41
PSQ [0.0 – 1.0]	16	0.46	0.43	0.20	0.11	0.91
<b>GRSS</b>						
<i>Total Number of Undesirable Events in Past Year [0 – 31]</i>	18	5.7	4.5	3.6	2	13
<i>Undesirable/negative rating of stressful events score [1 – 4]</i>	18	2.6	2.42	0.92	1	4
MCMI [3 – 12]	18	6.6	5.5	3.2	3	12
SRBW [11 – 55]	18	39.1	36.5	9.0	21	51
UFTCS [0 – 28]	18	13.9	13	4.7	6	26
BES [0 – 46]	15	13.5	10.0	9.5	1	40
NEQ [0 – 52]	18	16.4	13.0	9.7	5	45
SS-D [25 – 100]	8	62.1	61.5	6.2	56	72
SS-E [31 – 70]	11	47.8	47.7	13.6	31	70

Table 8: Pearson product moment correlations results for focus group participants

	1	2	3	4	5	6	7	8	9	10	11
1. BMI	--										
2. Education	0.19	--									
3. BES	0.44	0.13	--								
4. NEQ	0.37	0.00	0.74 <sup>2</sup>	--							
5. SRBWS	0.722	0.20	0.54 <sup>2</sup>	0.55 <sup>2</sup>	--						
6. MCMI	0.48	0.20	0.69 <sup>2</sup>	0.672	0.57 <sup>2</sup>	--					
7. UFTCS	0.05	0.39	0.62 <sup>2</sup>	0.50	0.00	0.59 <sup>2</sup>	--				
8. SS-D	0.19	0.82 <sup>2</sup>	0.60	0.23	0.26	0.05	0.17				
9. SS-E	0.08	0.20	0.11	0.10	0.22	0.12	0.20	0.61			
10. PSQ	0.32	0.02	0.61 <sup>2</sup>	0.71 <sup>2</sup>	0.44	0.632	0.71 <sup>2</sup>	0.03	0.18		
11. GRSS	0.19	0.15	0.57 <sup>2</sup>	0.78 <sup>2</sup>	0.30	0.45	0.43	0.08	0.23	0.71 <sup>2</sup>	
12. CES-DS	0.32	0.19	0.75 <sup>2</sup>	0.77 <sup>2</sup>	0.51 <sup>2</sup>	0.62 <sup>2</sup>	0.54 <sup>2</sup>	0.20	0.03	0.93 <sup>3</sup>	0.83 <sup>3</sup>

---

<sup>2</sup> Significant at  $p < 0.05$

<sup>3</sup> Significant at  $p < 0.01$



## **CHAPTER V: COMPARING PSYCHOSOCIAL CHARACTERISTICS AND LIFESTYLE BEHAVIORS OF AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE TO AFRICAN AMERICAN WOMEN WHO ARE OVERWEIGHT/OBESE: A CROSS-SECTIONAL STUDY**

### **V.A. Overview**

The number of individuals who are severely obese in the US is growing at twice the rate of the obese population. The public health and economic consequences of severe obesity are significantly greater compared to those who are just overweight or obese. African American women are more than twice as likely to become severely obese than women of all races/ethnicities. The purpose of this cross-sectional study is to examine differences between severely obese vs. obese and overweight African American women with regards to: physical activity, diet, physical and mental health and social support.

Studies with racially and ethnically heterogeneous samples have shown that individuals who are severely obese engage in less physical activity, eat less healthy diets, have poorer physical and mental health and lower levels of social support compared to their overweight or obese counterparts. To our knowledge, little work has been done investigating these relationships among southern African American women, a group that is at significantly higher risk of becoming severely obese.

Baseline data from African American participants in the HHL Project were used in this analysis. HHL was a 5-year communitywide research project in Lenoir County, NC a rural southeastern US city. Chi-Square analysis and Analysis of Variance—via multiple linear regression (MLR)—were used to assess differences between the two BMI groups. Data were

analyzed using SAS version 9.3 (SAS Institute, Cary, NC). Approximately 46% (n = 307) of the HHL participants were African American women; 185 (60.3%) were overweight or obese (BMI 25.1 – 39.9 kg/m<sup>2</sup>) and 112 (36.5%) were severely obese (BMI  $\geq$  40.0 kg/m<sup>2</sup>). African American women who are severely obese in this study were less physically active by objective measure, reported lower levels of self-assessed physical and mental well-being and reported poorer dietary habits.

While this is a small, geographically-focused sample identified to inform the design of a specific intervention, our findings are likely applicable to other interventions. Weight loss interventions targeting African American women with severe obesity should consider the potential impact of physical limitations and psychosocial challenges that this population may face. More research is needed to understand the specific weight loss needs of this highrisk population and the impact of appropriately tailored interventions.

## **V.B. Introduction**

The number of individuals who are severely obese in the US is growing at *twice* the rate of the obese population (those with a BMI between 30 kg/m<sup>2</sup> and 39.9 kg/m<sup>2</sup>, Classes I and II).<sup>1</sup> Finkelstein et al. predict that severe obesity prevalence in the year 2030 will be approximately 11% (a 130% increase from 2010).<sup>218</sup> Commensurate with patterns seen across all categories of BMI, the risk of becoming severely obese varies by both race and gender. Data from the National Health and Nutrition Examination Survey indicate that in 2010 African American were more than twice as likely to be severely obese than their Caucasian counterparts (18% vs. 8%).<sup>140</sup>

As evidenced by these findings, severe obesity and the associated health disparities are important public health problems. It is generally accepted that body weight is primarily determined by the balance of calories consumed—through food and beverages—compared to the

calories expended—through basal metabolic rate and daily activities (including exercise). The challenge in studying obesity comes from understanding the myriad of “secondary factors”—both internal and external—that can have an effect on this relatively simple energy balance equation (e.g. the balance of the two primary factors). The Social Ecological Model (SEM) is a commonly used framework for organizing and describing these secondary factors as well as understanding their often reciprocal and dynamic relationships.<sup>129</sup> The five categories of the SEM are: individual (knowledge, attitude, skills), interpersonal (social network), organizational (environment, ethos), community (cultural values, norms) and public policy.

Understanding the relative impact and interactions between these factors—both primary and secondary—is critical to being able to design obesity treatments. Some of the most well-studied secondary factors include: social support, physical health and mental health (especially depression and stress).<sup>219-225</sup> Recent research suggests that individuals who are severely obese may face different challenges in losing weight and hence their needs in a BWL intervention may be different than those who are just overweight or obese. It is important to understand these differences so that researchers can identify opportunities to tailor a weight loss intervention to meet the social, cultural, physical or any other relevant needs of the target population. Tailoring has been shown to improve treatment efficacy by improving treatment adherence.<sup>226</sup>

Most of the research with individuals who are severely obese to date has been in moderately-sized heterogeneous (with regards to both race and gender) samples, but weight loss needs may be modified by race/ethnicity and gender. To date, the characteristics and challenges and weight loss program needs of individuals who are severely obese and especially among African American women have not been well-defined and may be different than their overweight/moderately obese counterparts. Because African American women are at

significantly elevated risk of becoming severely obese, understanding these differences (if any) is important. Thus, the purpose of this cross-sectional study is to examine differences between severely obese and overweight/obese African American women with regards to selected lifestyle and psychosocial factors: physical activity, diet, physical and mental well-being and social support. Findings from this cross-sectional data analysis will be used to inform the development of an intervention we plan to conduct with southern African American women with severe obesity.

## **V.C. Methods**

### *Sample & Measurement Instruments*

This paper reports baseline data from the lifestyle and high blood pressure studies, 2 of 3 coordinated studies (lifestyle, high blood pressure and genomics) conducted as part of the HHL Project,<sup>193</sup> a collaborative research effort designed to reduce CVD risk and disparities in risk in Lenoir County, North Carolina. Lifestyle study participants were recruited from the community and also from the HHL high blood pressure study, which tested an intervention to improve BP management at local practices.<sup>192</sup> Participants in both studies completed a core set of demographic, health, and anthropometric measures with lifestyle study recipients receiving additional measures addressing dietary patterns and physical activity. Additional details about the study design and purpose are published elsewhere.<sup>192,193</sup>

Objective measures were used to data on participants' height, weight and stepsperday. Weight was measured with electronic scale (Seca 770; Seca, Columbia, MD) and height with a portable stadiometer (Schorr Productions, Olney, MD). Study protocols required at least two weight and height assessments be collected for every participant. Assessments were repeated until the difference in the measurements was < 1 pound for weight and less than ¼ inch for

height, with averages report. Women with a BMI  $\geq 40.0$  kg/m<sup>2</sup> were categorized as severely obese and women with a BMI ranging between 26.0 – 39.9 kg/m<sup>2</sup> were categorized as overweight/obese.

Pedometers were used to obtain an objective measure of physical activity on those taking part in the lifestyle study.<sup>192</sup> To assess steps/day, at the enrollment visit participants were instructed to wear an Omron HJ720ITC pedometer (Omron Healthcare, Bannockburn, IL) for at least 1 week during the next month, though they were encouraged to wear it daily (participants could observe step counts.) Pedometer steps for the baseline assessment were downloaded at the first counseling session. Steps/day were calculated as the mean of daily steps for all days of  $\geq 500$  steps/day during the preceding 31 days. Pedometer data was collected from 291 participants at their first counseling session; of those participants, 125 were African American women. Participants were included in our analysis only if they had a minimum of 3 days of wear with 500 or more steps on each of those days, which is considered to be a sufficient standard to estimate walking behaviors.<sup>227</sup>

Questionnaires (using validated measurement instruments with acceptable psychometrics) were used to collect information on dietary and physical activity behaviors, social support, and general health-related physical and mental well-being. Excluding the brief food frequency questionnaire addressing overall dietary quality (Dietary Risk Assessment [DRA]), these instruments were self-administered at the baseline study visit. For participants with perceived literacy difficulties or per their preference, questionnaires were administered verbally by trained research staff. An updated 26-item version of the DRA<sup>228-230</sup> was administered at the first lifestyle counseling intervention visit by the health counselor.

A modified and validated version of the RESIDE questionnaire originally developed by Giles-Cortes et al. (2006) was used to evaluate self-report time spent doing light, moderate and vigorous activities. The RESIDE questionnaire captures both leisure-time activities as well as activities of daily living. A total physical activity score is derived from 5 subscores, which capture the amount of time spent doing the following activities: (1) walking for nonwork activities, (2) walking for work activities, (3) moderate leisure time activities (other than walking), (4) vigorous leisure time activities (other than walking) and (5) vigorous activities during the workday.<sup>231,232</sup>

The SF12—a validated shortened version of the SF36—was used to assess general health related physical and mental well-being. Questions on the SF12 seek to capture information about an individual’s physical and social functioning, health perceptions, bodily pain and vitality.<sup>233, 234,235</sup> Two separate scores are generated from the survey: a Physical Composite Score (PCS) and Mental Composite Score (MCS). PCS and MCS values range from 0 – 100 with a higher score indicating better health status.

The Medical Outcomes Study social support survey (MOS-SS).<sup>236</sup> was used to assess 4 distinct aspects of social support including: emotional, tangible, affectionate and positive social interactions. The survey consists of 20 likert-style questions with scores for individual questions ranging from 1 – 5 and two open response questions inquiring about the number of (1) close friends and (2) close relatives. Higher scores on the 20 likert-type questions represent more social support.

### *Data Analysis*

Chi-Square analysis was used to assess differences between the two BMI groups for categorical variables. Analysis of variance (ANOVA)—via MLR to adjust for covariates—was

used to assess the differences for all continuous variables. Covariates were selected a priori based on a review of the literature.<sup>237,238</sup> Data were analyzed using SAS version 9.3 (SAS Institute, Cary, NC). The significance level was set at 0.05.

## **V.D. Results**

The full HHL study sample ( $n = 664$ ) was 38.1% White, 60.2% African American and 2.1% other; 71.5% were female and the average age was 56.8 years. A total of 307 African American women participated in the study; none were classified as underweight ( $\text{BMI} < 18.5 \text{ kg/m}^2$ ), 10 (3.3%) were normal weight ( $\text{BMI} 18.5 - 24.9 \text{ kg/m}^2$ ), 185 (60.3%) were overweight/obese ( $\text{BMI} 25.1 - 39.9 \text{ kg/m}^2$ ) and 112 (36.5%) were severely obese ( $\text{BMI} \geq 40.0 \text{ kg/m}^2$ ). There were no differences between the two BMI groups (overweight/obese and severely obese) for education, household income and number of comorbidities. However, severely obese women were on average younger (50.9 years vs. 57.2 years  $p < 0.01$ ); in all analyses using MLR we controlled for this factor. Demographic information for the female African American subsample is presented in Table 9.

Dietary behaviors, based on DRA scores collected from the Lifestyle study participants ( $n = 158$ ), are summarized in Table 10. The mean DRA score (adjusted for age) for the severely obese group was significantly lower than the overweight/obese group (26.2 v. 28.7,  $p = 0.02$ ). Lower scores are indicative of a dietary pattern that is associated with a higher risk for CVD. Significant differences between the two groups were found in two of four dietary subscores, including lower scores for fruit and vegetable intake (8.14 vs. 7.23,  $p = 0.01$ ), and drinks, desserts and snacks (8.33 vs. 7.53,  $p < 0.01$ ).

Significant differences between groups were found for both physical activity measures, self-report and objective (via pedometer). On the self-report modified RESIDE questionnaire

overweight/obese women scored higher/better on average than African American women who are severely obese (7.5 vs. 3.2,  $p < 0.01$ ). This should be interpreted – is this minutes per day or something else. Using the pedometer data overweight/obese African American women averaged approximately 5,141 steps per day compared to only 3,226 steps per day for their severely obese counterparts ( $p < 0.01$ ) a difference of about 2000 steps or the equivalent of approximately 1 mile per day of walking. See Table 12 and Table 13 for details.

Table 11 shows the results for the analysis of our psychosocial variables. Small, but statistically significant differences between BMI groups were found for both the PCS (43.4 vs. 40.6,  $p < 0.01$ ) and MCS (50.2 vs. 49.9  $p < 0.01$ ) with severely obese women having lower (e.g. less healthy) scores. No statistically significant differences between groups were found for any of the six social support scales including the average number of close friends and relatives.

## **V.E. Discussion and Conclusions**

In our sample of southern African American women, results for lifestyle and psychosocial variables were similar to those found in other studies. With regards to dietary patterns, our findings of lower intake of fruits and vegetables among African American women who are severely obese are similar to another large longitudinal study with African Americans.<sup>239</sup> and higher intake of desserts/sugar-sweetened beverages was associated with higher BMI as has been reported by recent review articles.<sup>240,241</sup> Similar to the findings of studies with mixed-race samples, African American women who are severely obese reported lower levels of both physical and mental health and well-being.<sup>119,224</sup> No significant differences in social support were found between the two BMI categories in our sample. A 2014 study by Johnson et al. also found that social support levels were not associated with body weight in their sample of African American women. Finally, the average number of steps-per-day measured in our sample were



comparable to those reported by another study with obese African American women.<sup>242</sup> and similar to the findings of Hornbuckle et al. (2005) where higher BMI was associated with lower levels of physical activity (specifically walking).<sup>243</sup>

The evidence is clear that maintaining a physically active lifestyle is key in maintaining a healthy body weight.<sup>91,142</sup> Our pedometer findings are similar to other studies with African American women. Newton et al. (2012) compared racial differences in pedometer-measured outcomes and reported that the African American women ( $n = 74$ ) in their study averaged 5,837 (394) steps per day. The mean BMI for all women in their study was  $31 \text{ kg/m}^2$ . Their findings were similar to the overweight/obese African American women in our study (5141 steps per day), but our standard deviation was considerably larger for a similarly sized sample (3344). The reasons for this difference are not entirely clear, but one contributor may be the characteristics of type of community from where each of the samples were derived; urban (Newton et al.) vs. rural (HHL). The Newton study participants were recruited from metropolitan areas—where walking is a more common practice for daily activities—whereas the HHL participants were recruited from a rural community—where distances between home and school, work, stores, etc. tend to be longer and necessitate travel by car.<sup>244</sup> The significant differences in steps-per-day between the two BMI-defined groups are also supported by other studies. Hornbuckle et al. (2005) compared anthropometric measurements (related to body fat) in a sample of African American women by stratifying them into groups based on their average steps per day. They found significant differences in BMI, percent body fat, waist circumference and hip circumference between the most active ( $\geq 5000$  stepsperday) and least active ( $\leq 5000$  stepsperday) groups. In each case, the indicators of heavier weight or larger body size were associated with lower physical activity.

Statistically significant differences between groups for the PCS and MCS variables were found in the expected directions. The PCS and MCS consist of a series of questions that inquire about how—if at all—the respondent’s current physical and/or emotional state has interfered with performing activities of daily living. The PCS results support the pedometer findings from ours and other studies (described previously). In addition, qualitative studies with (racially-heterogeneous) samples of preoperative bariatric surgery patients have found that individuals who are severely obese report experiencing pain in their feet, knees, joints and or hips and one-third reported back pain that can and does impair their ability to be active.<sup>119</sup>

Like physical activity, poor dietary habits have also been strongly linked to unhealthy body weights. The severely obese women in our sample scored significantly lower (worse) on the total DRA score as well as two of the four sub-scores (fruits/vegetables and drinks/desserts/snacks). There is strong evidence to support the link between diet and body weight; the evidence is especially strong with regard to fruit and vegetable intake (inverse relationship) and consumption of refined carbohydrates.<sup>245-247</sup> A study assessing dietary patterns associated with weight gain using data collected from the Black Women’s Health Study (n = 41,351) identified two dietary patterns: the “vegetables/fruit” pattern was associated with vegetables, fruit, legumes, fish, and whole grains whereas the “meat/fried foods” pattern was associated with red meat, processed meat, French fries, fried chicken, and added fat. Over 14 years, the “meat/fried foods pattern” was associated with significantly greater weight gain and the “vegetables/fruit” pattern was associated with significantly less weight gain between the highest and lowest quintiles.<sup>239</sup> A 2009 study by Sharma et al. (2009) that investigated the dietary intake patterns of an inner-city African American population found that the top contributors to calories were sodas (9.5%, #1), cake and pastries (4.3%, #4), sweetened drinks

(other than sodas) (3.8%, #6), chips (3.7%, #7) and candies (2.9%, #10).<sup>110</sup> Top contributors to sugar intake (natural and added) were sodas (34.1%, #1), other sweetened drinks (15.2%, #2) sweetened juices (9%, #3), sugar/syrup (8.3%, #4), cake and pastries (4.2%, #5), candies (4.1%, #6), ice cream (3.2%, #7) and cookies (2.5%, #8). The dietary patterns we found in the HHL study suggest that the severely overweight women were consuming some of the foods most associated with weight gain, as might be expected.

There is a broad and relatively robust literature supporting the important and positive role that social support can play in health behaviors among African Americans including diet and physical activity,<sup>60-63</sup> which are key components of a lifestyle based weight loss program. But there is also evidence to the contrary with several cross sectional studies in mixed race populations finding no relationship between social support and body weight.<sup>214-216</sup> Although a recent (2014) study looking exclusively at southern African American women came to the same conclusion (e.g. no relationship between social support and body weight), they did note that that overall, across BMI categories, scores for social support were low and there were significant differences between the support providers, with friends being more helpful/supportive than family.<sup>248</sup> Comparatively low social support levels for engaging in health behaviors among African American women has been found in several other studies.<sup>58,72,73</sup>

This study has both strengths and limitations that warrant mentioning. The two most notable strengths are (1) the objective height and weight measurements that were used to determine BMI and (2) the use of multiple measures of diet and physical activity using validated instruments. The limitations include the quality of the diet and physical activity measures (self-report and a limited objective measure – pedometer vs. accelerometer and possible reactivity with the pedometer), the limited number of psychosocial measures, especially no direct measure

of perceived stress and the small sample size for some variables. The most significant limitation is that the cross-sectional nature of this study, which not only limits our ability to analyze cause and affect relationships it also precludes testing for mediating and moderating variables. Due to the relatively high number of comparisons it is possible that some results were significant simply due to chance. Because this is a moderately-sized convenience sample in a limited geographical area, caution must be taken in generalizing the findings to African American women in other parts of the country. In addition, it is possible that women with BMIs near the upper limit of the overweight/obese category and lower limit of the severely obese category may be more similar than different.

Table 9: African American female HHL participant demographics

<b>Variable Name</b>	<b>Total n = 307</b>	<b>Overweight &amp; Obese n = 195</b>	<b>Severely Obese n = 112</b>	<b><i>p</i><sup>4</sup></b>
BMI (kg/m <sup>2</sup> ), mean (SD)	38.6 (9.7)	32.8 (4.7)	48.8 (7.6)	< 0.01
Age at Enrollment (y), mean (SD)	55.0 (12.4)	57.2 (11.7)	50.9 (12.1)	< 0.01
Education, mean (SD)	12.3 (2.4)	12.3 (2.4)	12.3 (2.6)	0.50
Participants with Household Income ≤ \$39,999 (%)	251 (81.9)	97 (49.8)	36 (32.1)	0.45
Number of Comorbidities, mean (SD)	2.7 (1.7)	2.8 (1.8)	2.7 (1.6)	0.62

---

<sup>4</sup>Difference between African American women who were overweight/moderately obese and those who were severely obese tested via ANCOVA, controlling for age, done via linear regression to account for uneven group size.

Table 10: DRA scores for African American female HHL participants<sup>5</sup>

<b>Variable Name</b>	<b>Total n = 158</b>	<b>Overweight &amp; Obese n = 105</b>	<b>Severely Obese n = 53</b>	<b><i>p</i><sup>6</sup></b>
Total DRA Score, mean (SD)	27.9 (5.4)	28.7 (5.5)	26.2 (4.8)	< 0.01
Nut Sub-Score, mean (SD)	6.28 (2.45)	6.45 (2.45)	5.94 (2.44)	0.09
Fruit and Vegetable Sub-Score, mean (SD)	7.84 (2.21)	8.14 (2.24)	7.23 (2.03)	0.01
Drinks, Desserts and Snacks Sub-Score, mean (SD)	8.07 (2.40)	8.33 (2.45)	7.53 (2.25)	< 0.01
Fish, Meat and Poultry Sub- Score, mean (SD)	5.74 (1.41)	5.71 (1.27)	5.73 (1.36)	0.46

---

<sup>5</sup> This dietary assessment measure was only given to participants in the Lifestyle Study (n = 158). The sub-sample was analyzed for differences between groups for demographic variables, and the only significant difference that was found was age, which was also found in the larger sample.

<sup>6</sup> Difference between African American women who were overweight/moderately obese and those who were severely obese tested via ANCOVA, controlling for age, done via linear regression to account for uneven group size.

Table 11: Physical Composite, Mental Composite and Social Support Scores for African American female HHL participants

<b>Variable Name</b> mean (SD)	<b>Total</b> n = 307	<b>Overweight &amp; Obese</b> n = 195	<b>Severely Obese</b> n = 112	<b><i>p</i><sup>7</sup></b>
Physical Composite Score	42.3 (10.7)	43.7 (10.6)	40.6 (10.7)	< 0.01
Mental Composite Score	50.1 (10.0)	50.2 (9.9)	49.9 (10.3)	< 0.01
Number of Close Friends	4.3 (4.9)	4.0 (4.0)	4.8 (4.4)	0.15
Number of Close Relatives	6.0 (8.5)	5.5 (6.2)	6.5 (10.8)	0.20
Emotional Support	72.9 (24.1)	74.1 (23.1)	70.6 (25.8)	0.51
Tangible Support	72.6 (25.3)	72.8 (24.3)	72.2 (27.0)	0.96
Affectionate Support	79.0 (24.8)	79.5 (24.5)	78.1 (27.1)	0.85
Positive Social Interactions	72.4 (26.6)	73.2 (25.5)	70.7 (28.5)	0.71

---

<sup>7</sup>Difference between African American women who were overweight/moderately obese and those who were severely obese tested via ANCOVA, controlling for age, done via linear regression to account for uneven group size.

Table 12: Pedometer measured steps per day for African American female HHL participants

<b>Variable Name</b>	<b>Total n = 125</b>	<b>Overweig ht &amp; Obese n = 83</b>	<b>Severely Obese n = 42</b>	<b><math>p^8</math></b>
Pedometer Measured Steps Per Day, mean (SD)	4498.0 (3791.0)	5141.7 (3344.1)	3225.8 (1758.8)	< 0.01

---

<sup>8</sup>Difference between African American women who were overweight/moderately obese and those who were severely obese tested via ANCOVA, controlling for age, done via linear regression to account for uneven group size.



Table 13: Physical activity scores for African American female HHL participants

<b>Variable Name</b>	<b>Total n = 307</b>	<b>Overweigh t &amp; Obese n = 195</b>	<b>Severely Obese n = 112</b>	<b><math>p^9</math></b>
Physical Activity Score, mean (SD)	6.1 (5.9)	7.5 (6.4)	3.2 (3.6)	< 0.01

---

<sup>9</sup>Difference between African American women who were overweight/moderately obese and those who were severely obese tested via ANCOVA, controlling for age, done via linear regression to account for uneven group size.

## **CHAPTER VI: THE S.T.R.E.N.G.T.H. (SHAPELY SISTERS TARGETING REALISTIC EXERCISE & NUTRITION GOALS THROUGH HEALTHY HABITS) STUDY: RESULTS FROM A RANDOMIZED CONTROLLED TRIAL TO EVALUATE THE FEASIBILITY OF A BEHAVIORAL WEIGHT LOSS PROGRAM FOR AFRICAN AMERICAN WOMEN WHO ARE SEVERELY OBESE**

### **VI.A. Overview**

“Severe” or “Class III” obesity is defined as having a BMI greater than or equal to 40 kg/m<sup>2</sup>, and individuals with severe obesity are at a significantly increased risk for heart disease, diabetes, stroke and cancer. The number of individuals who are severely obese in the US is growing at twice the rate of the obese population (those with a BMI between 30 kg/m<sup>2</sup> and 39.9 kg/m<sup>2</sup>). Similar to patterns observed across all categories of BMI, the risk of becoming severely obese varies by both race and gender. Data from the National Health and Nutrition Examination Survey (NHANES) indicate that in 2010, African American women were more than twice as likely to be severely obese than their Caucasian counterparts (18% vs. 8%). Research on effective severe obesity treatment should prioritize developing interventions for African American women because they are at highest risk. However, no studies could be identified focusing specifically on African American women who are severely obese. In this paper, we describe the program design and rationale for a targeted BWL weight loss intervention for African American women who are severely obese based on a review of the literature and formative research by our team. We also report the findings of a pilot study conducted to evaluate the intervention. Implications for research and practice are discussed.

## VI.B. Introduction

“Severe” or “Class III” obesity is defined as having a BMI greater than or equal to 40 kg/m<sup>2</sup>. These individuals are approximately 100 – 200 pounds or more heavier than their normal weight counterparts. This excess weight results in significantly higher chronic disease risks (heart disease, diabetes, stroke, cancer, etc.).<sup>128</sup> Further, individuals who are severely obese are more likely to encounter complications with medical interventions, which often necessitates a longer hospital stay.<sup>137</sup> Because of these factors, and others, severely obese patients incur healthcare costs significantly higher compared with their overweight (BMI 25 – 29.9 kg/m<sup>2</sup>) and obese (BMI 30 – 39.9 kg/m<sup>2</sup>) counterparts.<sup>1,137,138</sup> In their 2010 study, Finkelstein et al. report that the medical treatment expenses of individuals who are severely obese are approximately 100% higher than their normal weight counterparts. The number of individuals who are severely obese in the US is growing at *twice* the rate of the obese population (those with a BMI between 30 kg/m<sup>2</sup> and 39.9 kg/m<sup>2</sup>, Classes I and II).<sup>1</sup> Finkelstein et al predict that severe obesity prevalence in the year 2030 will be approximately 11% (a 130% increase from 2010).<sup>218</sup>

Commensurate with patterns observed across all categories of BMI, the risk of becoming severely obese varies by both race and gender. Data from the National Health and Nutrition Examination Survey indicate that in 2010 African American women were more than twice as likely to be severely obese than their Caucasian counterparts (18% vs. 8%).<sup>140</sup> Research on effective treatments for severe obesity should prioritize developing treatments for groups who are at highest risk—in this case, African American women—for two reasons. First, helping those most at risk can have the biggest impact (positive) on the adverse health and economic outcomes of severe obesity. Second, risk disparities—especially those that are as large as the ones here—are the fundamental cause of health disparities. Addressing health disparities has been a priority

for the past two decades for the Healthy People initiative. In Healthy People 2020 the goal is “to achieve health equity, eliminate disparities, and improve the health of all groups”.<sup>139</sup>

Multiple studies and reviews indicate that bariatric surgery is clearly an effective treatment for reducing body weight in individuals who are severely obese.<sup>141</sup> And, for certain populations, weight loss surgery is an appropriate option. However, the major focus on this form of treatment.<sup>142,249</sup> for severely obese populations—to the relative neglect of all others—is concerning for several reasons. First, concerns remain about the ability of this type of treatment to meet the growing population demand; only 1% of all severely obese adults in the US undergo bariatric surgery each year.<sup>142</sup> There are likely many reasons for this low rate including individual patient decisions, inability to meet presurgical requirements, inadequate or non-existent insurance coverage and/or being denied by an insurance provider. Disparities of uptake of bariatric surgery among minority groups are also clearly evident. For example, African Americans make up 21% of all individuals who are eligible for bariatric surgery yet only 9% of those undergoing bariatric surgery are African American; whereas 67% of those eligible for bariatric surgery are Caucasian and 67% of those receiving treatment are Caucasian.<sup>148</sup> Reasons for this disparity are not entirely clear, but preliminary data are suggestive of factors that are not easily subject to modification including: inadequate insurance coverage,<sup>149</sup> economic concerns.<sup>149</sup> and cultural preferences.<sup>57</sup>

The focus on bariatric surgery as a treatment for severe obesity has resulted in a paucity of information on how to design BWL interventions for individuals who are severely obese. Developing effective BWL interventions for individuals who are severely obese is important for two reasons. First, as discussed previously, bariatric surgery alone is not sufficient to meet the diverse needs of the growing severely obese population. As reported by Blackburn et al. (2010)

“Although weightloss surgery is the most effective treatment, it offers little in the way of largescale containment due to its costly and invasive nature. BWL interventions that induce modest weight loss and improve fitness can significantly lower disease risk...[and, therefore].... should be a high priority in nutrition medicine”.<sup>250</sup> Second, BWL interventions teach important skills that will be important for weight maintenance after bariatric surgery.<sup>251</sup> Only a small handful of quality BWL intervention studies with individuals who are severely obese have been published.<sup>142,156,249</sup> However, findings from these studies with racially heterogeneous samples indicate that BWL interventions are desired and feasible and most importantly, they can produce clinically significant weight losses. Additional details regarding the sample demographics and weight loss outcomes for these three studies can be found in Table 5.

The efficacy of public health interventions can be greatly improved through targeting, or “developing...a single intervention approach for a defined population sub-group [taking] into account characteristics [that are] shared by the sub-group’s members”.<sup>172,252</sup> Two of the most relevant characteristics of our target population—African American women who are severely obese—are culture and extremely high body weight. A handful of published studies contain information that could be used to tailor interventions for heterogeneous groups of individuals who are severely obese and also for overweight and moderately obese African American women. However, no studies could be found focusing specifically on interventions for African American women who are severely obese. In this paper we describe the program design rationale for a targeted BWL intervention for African American women who are severely obese based on a review of the literature and formative research conducted by our team. We also report the findings of a pilot study conducted to test feasibility.

## **VI.C. Methods**

### *Study Overview*

For the formative research, we conducted focus groups and a cross-sectional analysis of an existing dataset, then used the findings (in combination with information from the literature) to develop an intervention. The aims of our formative research were to: (1) examine reported differences between African American women who are severely obese and overweight/obese African American women with regards to physical and mental health, dietary and physical activity behaviors and (2) to understand the perceived impact of stress on weight-related behaviors among African American women who are severely obese and elicit opinions regarding strategies to help reduce stress. We used this information to develop and pilot-test a targeted intervention using a 2-arm randomized control trial.

### *Rationale and Description of Intervention Development*

#### CORE CONTENT

The core content of the BWL program was based on the Weight Wise Program (WWP) developed by Samuel-Hodge et al. (2009).<sup>253</sup> WWP is a 16-week group-based weight loss intervention designed to meet the needs of low-income African American women. WWP was developed by blending two evidence-based weight loss interventions: The DPP<sup>254,255</sup> and the Dietary Approaches to Stop Hypertension (DASH) intervention, that was used in the PREMIER trial.<sup>256</sup> Like the DPP and DASH, WWP is a goalbased behavioral intervention program. The WWP set goals for weight loss ( $\geq 4.5$  kg total or  $0.45 - 0.9$  kg/week), physical activity ( $\geq 150$  minutes/week), diet (7+ servings of fruits and vegetables and 2-3 servings of lowfat dairy per day) and self-monitoring (daily dietary intake, physical activity and weight). A health counselor trained in motivational interviewing led the group meetings. Each session lasted 2 hours and

followed a general schedule, which included the following: weigh-in, group check-in and problem solving, discussion of core weight management topic, nutrition or exercise related activity, closing discussion with goal setting.

The only major modification we made to the core content was to reduce the number of sessions from 16 to 14, increase the intervention duration from four to six months, and change the frequency of the meetings (from weekly for 16 weeks with WWP to weekly for the first month then every other week for months 2 – 6). These changes were made primarily due to feasibility and cost. We made sure that even with the modifications our intervention would still meet the minimum standard for interventions described in the 2013 American Heart Association/American College of Cardiology /The Obesity Society (AHA/ACC/TOS) guidelines for the management of overweight and obesity in adults.<sup>151</sup> (minimum of 14 sessions delivered over the course of 6 months). When adapting the content of the curriculum to fit the condensed schedule we ensured that the program retained the core elements or “aspects of an intervention that are central to its theory and logic and that are thought to be responsible for the intervention’s effectiveness”<sup>257,258</sup>.

#### SURFACE- AND DEEP-STRUCTURE MODIFICATIONS

We considered surface-structure intervention modifications to be a widely accepted practice and a minimum standard for developing effective interventions. Because we view these adaptations as part of the intervention’s core components they were included in both the ST and ST+SR groups and were not considered a part of targeting to be formally tested by the pilot study. The majority of our surface-structure modifications were guided by the literature. Specific adaptations that we included were: (1) hiring an African American female as the interventionist, (2) ensuring any graphics used in the recruitment materials, on the website or in the curriculum

were culturally relevant. Two of our surface-structure modifications however, were based—in large part—on information we gathered from our formative research. First, findings from our cross-sectional analysis confirmed that physical health ratings were poorer in African American women who are severely obese. This finding was similar to studies with racially heterogeneous severely obese samples in which poorer physical health was positively associated with the presence of one or more physical impairments.<sup>119</sup> Ensuring the safety of our participants was our top priority. Because we were unable to find any specific published safety guidelines for working with severely obese populations, as a precaution we screened all participants for risk factors that could contraindicate engaging in moderate levels of physical activity and were cognizant of the potential physical movement limitations when deciding which exercises to incorporate in the program. Second, a common theme noted from our focus group sessions was a desire to have an interventionist that was a match to their race AND body type.

As described previously, the impact of stress in the lives of African American women is a salient theme in the literature and represents a potential topic to incorporate in deep-structure modifications. Most weight loss interventions incorporate general stress management techniques. However, findings from previous studies suggest that this component may not be sufficient or relevant to the needs of African American women. One study by Cox and colleagues tested a stress-focused BWL intervention in small sample of African American women (all BMI levels); although their results were not statistically significant the trends indicated that the stress-focused intervention had a positive impact on weight loss.<sup>6</sup>

Using the literature and findings from our focus group sessions we developed a weight loss program (hereafter referred to as the “Standard Treatment + Stress Reduction group”) that incorporated deep-structure cultural modifications in the curriculum content with a particular



focus on stress reduction. The Standard Treatment + Stress Reduction group received all of the core content of the BWL intervention that the standard treatment group receives, but for 12 of the 14 sessions the Standard Treatment + Stress Reduction group received additional information on stress-reduction. To ensure there was enough time to include the additional stress reduction content, a few additional modifications to the core curriculum in this group were made.

The stress reductionThe stress reduction content was divided into three phases: phase 1 – reduce the number of stressors (sessions 3 – 7), phase 2 – change your thoughts and perceptions (sessions 8 – 9) and phase 3 – elevate your mood and improve your coping responses (sessions 11 – 12).<sup>259,260</sup> During sessions 1 and 2 participants received background information about (1) the role of stress in weight management (session 1) and (2) how this program would target stress (session 2). See Table 14 for more details on the content of the individual sessions for both the treatment and standard treatment groups.

#### RECRUITMENT

All study-related activities took place at the Center for Health Promotion and Disease Prevention (HPDP). HPDP is a CDC Prevention Research Center that is part of the University of North Carolina at Chapel Hill (UNC-CH). The building is accessible via public transportation. The two primary recruitment methods were (1) UNC-CH listservs and (2) a television commercial targeted for African American women that was aired through a local cable service provider. Recruitment materials directed interested women to our study website ([www.strengthstudy.com](http://www.strengthstudy.com)) to complete a screening questionnaire to see if they were eligible.

#### INCLUSION/EXCLUSION CRITERIA

Inclusion criteria included: African American (self-identified), female, BMI  $\geq 40$  kg/m<sup>2</sup>, access to internet connection and phone for personal use. Women were excluded if they: were

unable to walk without the use of an assistance device; failed<sup>10</sup> the Physical Activity Readiness Questionnaire (PAR-Q) *and* unable to attain medical clearance from their doctor; had a history of substance abuse within past two years; had ever been diagnosed with schizophrenia; were currently pregnant or pregnant within the past 6 months or plans to become pregnant in the next 6 months; had a history of malignancy other than non-melanoma skin cancer that has not been in remission or cured surgically for > 5 years; had participated in a weight loss program in the past 12 months; had lost > 5% loss of body weight within the past 6 months; had ever undergone bariatric surgery; had a heart attack in the past 6 months; or had a stroke in the past 6 months.

#### SESSION DETAILS

To help accommodate participants' schedules both intervention programs were offered at two meeting times each week (Standard Treatment + Stress Reduction groups met on Mondays from 6 – 8 PM and Saturdays from 10 AM – 12 PM, standard treatment groups met on Wednesdays from 6 – 8 PM and Saturdays from 1 – 3 PM). Group sessions occurred weekly for the first month of the intervention (sessions 1 – 4) and every other week for the remaining five months (sessions 5 – 14). Each session lasted approximately 2 hours and followed the same general format: (1) weight assessment, (2) checkin discussion and problem solving, (3) discussion of a weight management topic related to nutrition, PA, or behavior change, (4) nutrition or physical activity demonstration and/or practice activities, (5) recap and announcements about next session, (6) goal-setting. An African American woman served as the study interventionist. At the time of the intervention she was a dietetics student who was also seeking certification as a health coach, and her BMI fell in the overweight category in response

---

<sup>10</sup> Answering “yes” to one or more of the 7 screening questions.

to focus group findings suggesting that an interventionist with a similar body weight was important. She had extensive experience as a fitness instructor for Zumba, African dance, hiphop and aerobics. Prior to the start of the program the interventionist received training on group-facilitation and other study-related protocols.

During their first session all participants were given a personalized report containing an estimate of their current caloric intake and their calorie range goal for this program (calculated using the MifflinSt. Jeor equation)<sup>165</sup>; the lower and upper numbers in the range were determined by subtracting 1000 and 500 calories, respectively from the estimated current calorie intake. Calorie goals were designed to induce a weight loss of 1 – 2 pounds per week. No recommendations were lower than 1200 calories per day.

Participants used the online MyFitnessPal program<sup>261</sup> and accompanying phone and Tablet apps to monitor their daily dietary intake and physical activity.<sup>11</sup> Participants were encouraged to weigh at home and use the program to monitor their progress but this was not a requirement. Weight was assessed at the start of each session. When the groups met every other week participants were asked to log their weight online through our study's website. The study PI had access to view the MyFitnessPal accounts for all participants, which allowed her to review each participant's self-monitoring records and provide feedback. Individualized progress reports were provided to participants at weeks 8, 16 and 24. Reports summarized progress from the previous 8 weeks of the program and included information on: attendance, calorie intake (daily average), physical activity (daily average in minutes), completeness of self-monitoring logs and weight loss.

---

<sup>11</sup>Study participants used their personal devices to access these applications. The study did not provide participants with either phones or tablets.

## OUTCOME MEASURES & DATA COLLECTION METHODS

Participants meeting eligibility criteria (as assessed through the online questionnaire) were invited to attend a 30-minute study enrollment visit. After obtaining written consent, a student research assistant collected data for the two objective outcome measures: BMI (height and weight, primary outcome) and mobility (Timed-Up-and-Go Test, more info below). All student research assistants were provided with measurement protocols and trained on how to use the equipment and record the data. Weight was measured using electronic scales (Seca 770; Seca, Columbia, MD) and height was measured with a portable stadiometer (Schorr Productions, Olney, MD). Study protocols required at least two weight and height assessments be collected for every participant. Assessments were repeated until the difference in the measurements were < 1 pound for weight and less than ¼ inch for height. The official height and weight measurements were determined by averaging the closest two numbers. Height was assessed at baseline only. Weight was assessed by trained research assistants at baseline and at 6 months using the 2 assessment protocols. The study interventionist assessed weight at the beginning of each session with a single weight measurement.

Excess body weight can have a negative effect on physical mobility,<sup>262</sup> which can hinder weight loss behaviors. The “Timed-Up-and-Go” (TUG) test is a reliable and valid tool for assessing functional mobility.<sup>263</sup> To administer the test the researcher has the participant sit in a standard armchair with their back touching the back of the chair. When the researcher says “go” the participant stands up, walks a distance of 10 feet (the stopping point is marked on the floor), then turns around, walks back to their chair and sits back down. The researcher starts the clock when they say “go” and stops the clock when the participant returns to their seat. Student

research assistants were given protocols explaining how to setup and administer the test. The TUG test was administered at baseline and at 6 months.

At the completion of their enrollment visit participants were provided with written instructions on how to access and complete the online questionnaire (via Qualtrics, <https://software.unc.edu/qualtrics/>). Participants were instructed to complete the questionnaire within the next 7 days from home. The questionnaire contained approximately 200 questions and took approximately 1 hour to complete. The questionnaire was administered at baseline and at follow-up.

The questionnaire was identical to the one used for Aim 1 except that it contained two additional measures; (1) the DRA food frequency questionnaire and (2) the modified/validated RESIDE questionnaire to evaluate self-report time spent doing light, moderate and vigorous activities. Details regarding the BES, NEQ, UFTCS, SS-D, SS-E, PSQ, GRSS, CES-DS, MCMI and/or SRBWS can be found in Chapter IV (see page 58 for Methods). See Appendix VII for full details on measurement tools used in the questionnaire.

An updated 26-item version of the DRA, a short food frequency questionnaire developed by Ammerman et al. in 1991 and updated and validated in 2006<sup>228-230</sup> was used to assess overall dietary intake. A modified and validated version of the RESIDE questionnaire originally developed by Giles-Cortes et al. (2006) was used to evaluate self-report time spent doing light, moderate and vigorous activities. The RESIDE questionnaire captures both leisure-time activities as well as activities of daily living. A total physical activity score is derived from 5 subscores, which capture the amount of time spent doing the following activities: (1) walking for nonwork activities, (2) walking for work activities, (3) moderate leisure time activities (other than

walking), (4) vigorous leisure time activities (other than walking) and (5) vigorous activities during the workday.<sup>231,232</sup>

#### RANDOMIZATION

A staff member (not involved with data collection) was given a randomization table that was generated by a statistical consultant. Participants were randomly assigned at a 1:1 ratio to one of the two study arms. The ST+SR received the BWL intervention and the stress reduction content and the ST group received the BWL intervention only.

#### PARTICIPANT RETENTION STRATEGIES

The research team made many efforts to decrease attrition and to increase follow-up data collection. To improve attendance, the PI (DB) monitored session attendance and followed up with all participants who did not attend their assigned session (except in cases where the participant notified the interventionist or PI of their absence in advance). The amount and specific type of correspondence varied by the needs and situation of the individual participants, but, in general, the following general protocols were followed. When one session was missed the participant would receive an email from the PI telling the participant that we missed them at the session this week, that we were thinking about them and wanted to make sure everything was OK. If no response was received within 3 – 5 days, a second follow-up email was sent. If two consecutive sessions were missed this process was repeated but additional information was added to ensure the participant that it was never too late to get back on track. If no response was received a maximum of two text messages were sent to the participant. If three sessions were missed in a row, the email protocols were repeated and text was added to let the participant know that they would not receive any more reminders regarding session attendance BUT it was clearly explained that they could rejoin the group sessions at any time. The email also included

information regarding follow-up weight measurements, which explained that their participation was highly valued and reminded them of the \$25 incentive for completing the measures. If no response was received a maximum of two text-messages were sent to the participant.

Approximately 1 week before the conclusion of the study all participants were mailed a hand-addressed card from the entire research team. The contents of the card thanked them for their participation and provided details of the upcoming dates and times for measurement collections and reminded participants about the importance of data collection regardless of level of participation in the study. The letter also included a small incentive (studythemed keychain). Two measurement times were offered and refreshments were served at each session. We collected weight and TUG measures from 17 participants during these two sessions. After the two measurement sessions research staff emailed all of the remaining participants to offer to meet them at their home or office to collect their final weight measurement. Using this approach our team was able to collect data from an additional two participants.

#### DATA ANALYSIS

Our primary outcome is difference in weight change between the two groups at 6-months follow-up compared using a 2-sample t-test. We used an ITT approach with baseline values carried forward for missing data at follow-up. All statistical tests were performed using SAS version 9.3 (SAS Institute, Cary, NC). Reported p-values are two sided and  $p < 0.05$  was considered statistically significant. In conducting and reporting this study we have followed the Consolidated Standards of Reporting Trials guidelines.<sup>183</sup> Results of our power calculation indicate that we need approximately 60 subjects, 30 in each arm, in order to be able to have 80% power to detect a 2.5 kg mean weight difference between the two arms at 6 months of follow-up assuming a SD of change in body weight to be 3.0 kg.

## VI.D. Results

A total of 55 women were deemed eligible based on initial screening criteria for eligibility and were invited to attend an enrollment screening visit; of those 55 women, 9 were deemed ineligible due to their BMIs being too low (based on measured height and weight). As depicted in Figure 6, 46 women were randomized at the start of the intervention; 23 to the Standard Treatment + Stress Reduction group and 23 to the Standard Treatment group. Women were on average 40.3 years old. The mean baseline weight was 276.3 lbs. (range = 198.4 – 460.8; Q1 = 242.6; Q3 = 305.9) and the average BMI was 46.9 kg/m<sup>2</sup> (range = 35.6 – 73.9; Q1 = 41.4; Q3 = 50.3). The great majority (82.2%) of women were working full time (82.2%) and all had at least 1 year of post-secondary education. Approximately half of the women had annual household incomes between \$40-\$69K. We found that household income ( $p = 0.04$ ) was significantly different between the two groups (the Standard Treatment + Stress Reduction group had higher incomes). Baseline participant characteristics are reported in Table 15.

Between the date that participants received their randomization assignment (along with their two day/time options to attend classes) and the first day of sessions our staff was contacted by 3 participants informing us that they would not be able to take part in the classes. One participant discovered unexpectedly that she would be moving with her family to another state. The remaining two participants were not able to attend either of the session times that were offered. Attendance data show that nine participants never attended a session; the reasons for non-participation remain unclear. The results of a binary analysis did not find a relationship between attendance and baseline BMI (0.01,  $p = 0.93$ ). One final observation was that of the 9 participants who never attended, 7 were randomized to the standard treatment group and only two were randomized to the Standard Treatment + Stress Reduction group. The results of our



exploratory analysis of the missing data revealed that loss-to-follow-up was significantly and positively associated with attendance and attendance was significantly associated with group assignment.

### *Primary Outcome*

Results from the 2-sample t-test using ITT with baseline values carried forward found that there were no significant differences in weight loss between groups; -2.5 kg (4.8) vs. -0.40 kg (2.4) for ST+SR and ST groups, respectively ( $p = 0.17$ ). We repeated the analysis using an equivalent nonparametric test and the results were similar ( $p = 0.17$ ). Because there was a statistically significant difference between groups at baseline for income, we performed another t-test (using ITT) via MLR, controlling for this variable. The difference between the groups remained insignificant ( $p = 0.59$ ). We conducted an exploratory analysis using only completers and the significance level remained the same ( $p = 0.58$ ). See Table 16 for more details.

Despite efforts to obtain follow-up data, the attrition rate for our study was high (total  $n = 27$ , 59%; Standard Treatment + Stress Reduction group,  $n = 11$ , 49%; Standard Treatment Group,  $n = 16$ , 70%). We conducted an analysis to examine patterns or associations in missing data. We found that loss-to-follow-up was significantly and negatively correlated with attendance (0.37,  $p = 0.01$ ) (those who attended more frequently were more likely to complete follow-up measures) and attendance was significantly associated with group assignment (0.39  $p < 0.01$ ) with Standard Treatment + Stress Reduction group participants having greater attendance. Participants received feedback reports three times during the study; at the end of 8 weeks, 16 weeks and at 24 weeks (end of the study). For the 8-week report, 20 participants had at least one entry in their MyFitnessPal account. Of those 20 participants the average number of recorded days was 30 (of 48 possible days, 63%). By the second reporting period (week 16) the

number of participants with at least one entry dropped to 11 and the average percent of days recorded dropped to 56% (32 days of 54 possible days). For the third reporting period (24 weeks, end-of-study) 5 participants had logged at least one entry with 45% (21 of 47 possible days).

### *Secondary Outcomes*

At baseline, the mean time for all participants to complete the TUG test was 9.6 seconds. The raw average PSQ score was 0.52 and the mean number of stressful events experienced in the past year was 3.5. See Table 15 for additional results. Because response rates for all secondary outcomes were low (TUG and questionnaire,  $n = 17$ ), we are only reporting the baseline results in this paper. – since your study is focused on Stress – I believe that for your analysis of the primary mediator – stress – you should select the folks you have baseline and f-up on – and compare in the completers sample those who attended follow-up and look at stress comparing the groups – this is a “treated” analysis but would tell you – if they came did they reduce any stress.

### *Process Evaluation*

Mean attendance was 3.2 (of 14) for all participants, 4.2 for Standard Treatment + Stress Reduction group participants and 2.3 for standard treatment group participants, respectively. Approximately half of participants attended two or fewer sessions; of those participants nine never attended a session. The maximum number of classes attended was 10 (71.4% of classes). After the study concluded all participants in the Standard Treatment + Stress Reduction group were asked to complete a very short questionnaire (8 ranking questions with space to leave comments if desired) to assess their opinions of the stress-reduction content. All participants in the Standard Treatment + Stress Reduction group—regardless of their session attendance were emailed the link and asked to complete the online questionnaire. Of the twenty-three participants

in the Standard Treatment + Stress Reduction group, 7 responded. One responder had not attended any sessions; because the questions asked participants to reflect on their own experiences in class with the materials when they were answering the questions, we excluded this respondent's answers in the analysis.

Attendance was relatively high for the 6 women who replied (6.7 sessions). Using a 10-point likert scale, participants were asked to indicate how useful they found each of the following topics or activities in reducing their stress levels. In order from most helpful to least helpful, their responses were as follows: social support (9.1), time management (8.4), identifying and refuting irrational thoughts (8.1), practicing joyful attention (7.3), mindful breathing (7.0), meditation (6.0) and yoga (5.3).

## **VI.E. Discussion and Conclusions**

Low attendance at intervention sessions and high rates of attrition for follow-up data collection were significant challenges for this study. Both race and BMI have been investigated as variables that could predict attrition. Several smaller weight loss trials report attrition rates among African American participants (both men and women) similar to Caucasian participants (e.g., between 20 – 25%).<sup>8,62,264-268</sup> Similar findings were reported in two recent reviews by Moroshko et al. (2011) and Fitzgibbon et al. (2012).<sup>32,269</sup> The authors of the Moroshko et al. paper report that there were no significant differences in attrition by race. Similarly, Fitzgibbon et al. (2012) report that attrition rates for African Americans in some of the studies they reviewed were in some cases < 10%. However, it should be noted that Moroshko et al. based their conclusion on only 4 studies and the higher retention rates reported by Fitzgibbon et al. were based on multi-center trials, which can be expected considering these studies typically have more resources to both monitor and prevent lost to follow-up. However, other studies have found

evidence of higher attrition rates within African American samples. A recently published systematic review by Samuel-Hodge et al.<sup>175</sup> examined the effectiveness of DPP translations among African Americans. The authors reviewed a total of 17 studies; 7 studies had 100% African American samples and the remaining 10 had mixed sample with African American subgroups. The mean attendance rate for the African American only samples was 56% (range 33 – 69%) and 62% (range 50 – 72%) for the mixed-race samples. The mean attrition rate for the African American only samples was 22% (range 12-41%) for the African American only samples and 18% (range 3-34%) for the mixed-race samples. Similarly, a systematic review by Lemacks et al. (2013) that examined attrition rates among African American taking part in physical activity interventions found that attrition rates were significantly higher for African Americans (20%) than for Caucasians (13%).<sup>176</sup> With regards to body size, a recently published article by Goode et al. (2016) reviewed predictors of attrition across three clinical behavioral weight loss programs (n = 504, 85% female and 74% Caucasian) and found that for every one unit increase in BMI, the odds of attrition increased by 11%. Teixeira et al. report similar findings in their study of predictors of attrition in a weight loss study with 158 men and women. They report that baseline BMI was significantly ( $p < 0.001$ ) associated with increased risk for attrition<sup>270</sup>

As previously reported, the results of our exploratory analysis of the missing data revealed that loss-to-follow-up was significantly and positively associated with attendance and attendance was significantly associated with group assignment. Although all participants were assured that both groups were offering a core program that had been proven to be efficacious for weight loss, it is possible that some of the women who were randomized to the standard treatment group felt they had been jilted in some way, which may have changed their minds

about participating in the study. Another explanation may relate to socioeconomic status. As discussed previously, significant differences in baseline income were found between groups: 61.9% of the Standard Treatment + Stress Reduction group reported having an income  $\geq$  \$40K compared to only 47.4% in the standard treatment group. Previous studies have found a significant relationship between economic status and attrition, with lower income participants more likely to drop out.<sup>271</sup> However, income did not appear to be associated with attrition in our study ( $r = -0.08$ ,  $p = 0.6$ ). Another characteristic to consider with regards to the overall high attrition rate is that our sample was relatively highly-educated and the majority were working full-time. It is possible that work commitments were a considerable barrier to continuing with the program. Anecdotally, two to three of the participants expressed their desire for an online version of the program to various members of the research team.

Of the participants who notified research staff that they would be unable to attend any future sessions ( $n = 18$ ), 9 women cited “personal issues” as the reason. Not all women provided additional details but those who did frequently cited one or more of the following: health concerns (for themselves or immediate family members) ( $n = 4$ ), death in the family ( $n = 3$ ), transportation issues ( $n = 2$ ) and/or job loss ( $n = 1$ ). Seven of the 18 women cited schedule conflicts as the participation barrier. One participant moved to another state prior to the first session and another cited that she needed a more intensive program with more individual accountability.

Results of our bivariate analyses did show a significant and relatively strong correlation between baseline BMI and baseline mobility (higher BMI, lower mobility), as measured by the TUG test ( $0.54$ ,  $p < 0.01$ ). This finding was expected given the evidence supporting the critical role that physical activity plays in weight loss.<sup>272</sup> Our results support the findings from other

studies. A 2015 study by Correia et al. found a negative and significant association between BMI and performance on the 6 Minute Walk Test among severely obese individuals.<sup>225</sup> An earlier, 2012 study, evaluated walking limitations by age and BMI using data from the Longitudinal Assessment of Bariatric Surgery study (n = 2,458; BMI 33.9 kg/m<sup>2</sup>). The authors report that 64% of the subjects reported limitations when walking several blocks and 48% had an objectively defined mobility deficit. In their conclusions the authors note increased prevalence of walking impairments even in those in the lower BMI range.<sup>122</sup>

As expected, stress levels measured through the PSQ were also highly correlated with number of stressful events experienced during the past 12 months as measured by the GRSS. Women in our sample reported experiencing, on average, 3.5 undesirable life events in the past year (The average rating was 2.6 (out of 4) ( $r = 0.44592$ ,  $p < 0.012$ ). The most frequently cited events were: (1) being confronted with negative media about African American men (72%, mean score = 2.72), (2) being confronted about negative media about the African American family (54%, mean score = 2.68) and (3) having serious arguments with someone several times (52%, mean score = 3.08).

#### STUDY STRENGTHS & WEAKNESSES

One of the main strengths of this study is that it focused on African American women, a population that is at high risk of obesity and also understudied. In addition, research with populations with the specific combination of race and weight characteristics as ours are even rarer. Our primary outcome (weight) and one of our secondary outcomes (TUG) were objectively measured using written protocols by trained research assistants and we assessed several psychosocial variables through an online questionnaire.

Our study also has several limitations. Our biggest limitation is the threat to internal validity due to the low adherence and high attrition rates (discussed previously). Additionally, our sample size was small and was comprised of volunteers, thus they may not be representative of the general population. Furthermore, the benefits of weight loss are dependent on weight loss maintenance and our study was not designed to measure this outcome. The timing of our study could have enhanced our recruitment strategies. More specifically, because our recruitment period fell within the first months of the year (January – March) it is possible that New Years resolutions may have resulted in heightened interest in the program.

Table 14: Session topics by group for the STRENGTH study

Session No.	Standard Treatment + Stress Reduction group	Standard Treatment group
1	<ul style="list-style-type: none"> <li>• Welcome and Introductions</li> <li>• Study Goals</li> <li>• Participant/Leader Expectations</li> <li>• How Weight Loss Works</li> <li>• The StressHealth Relationship<sup>12</sup></li> <li>• Getting Started with Exercise and Self-monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Welcome and Introductions</li> <li>• Study Goals</li> <li>• Participant/Leader Expectations</li> <li>• How Weight Loss Works</li> <li>• Getting Started with Exercise and Self-monitoring</li> </ul>
2	<ul style="list-style-type: none"> <li>• How STRENGTH Addresses Stress<sup>12</sup></li> <li>• Physical Activity   Finding Time + Types</li> <li>• Listen to Your Body   Heart Rate Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Physical Activity   Finding Time + Types</li> <li>• Listen to Your Body   Heart Rate Monitoring</li> </ul>
3	<ul style="list-style-type: none"> <li>• Focusing on Calorie Sources</li> <li>• Ways to Eat Fewer Calories</li> <li>• Sources of Stress<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Focusing on Calorie Sources</li> <li>• Ways to Eat Fewer Calories</li> </ul>
4	<ul style="list-style-type: none"> <li>• Portion Size vs. Serving Size</li> <li>• Reading Labels</li> <li>• Labeling Our Stressors<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Portion Size vs. Serving Size</li> <li>• Reading Labels</li> </ul>
5	<ul style="list-style-type: none"> <li>• Time Management<sup>12</sup></li> <li>• Planning Ahead for Meals</li> <li>• Shopping for Healthy Foods</li> </ul>	<ul style="list-style-type: none"> <li>• Planning Ahead for Meals</li> <li>• Shopping for Healthy Foods</li> <li>• Paying Attention to Time</li> </ul>
6	<ul style="list-style-type: none"> <li>• Personal Feedback Report #1</li> <li>• Finding Time to Exercise</li> <li>• Budgeting Basics<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Personal Feedback Report #1</li> <li>• Finding Time to Exercise</li> </ul>
7	<ul style="list-style-type: none"> <li>• Healthy Dinners</li> <li>• Social Support<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Healthy Dinners</li> <li>• Making Use of Family Support</li> </ul>
8	<ul style="list-style-type: none"> <li>• Healthy Snacking</li> </ul>	<ul style="list-style-type: none"> <li>• Healthy Snacking</li> </ul>

---

<sup>12</sup>“stress-reduction” content



	<ul style="list-style-type: none"> <li>• Mindful Eating</li> <li>• Irrational Thoughts<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Mindful Eating</li> </ul>
9	<ul style="list-style-type: none"> <li>• Dining Out</li> <li>• Joyful Attention<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Dining Out</li> </ul>
10	<ul style="list-style-type: none"> <li>• Sleep</li> </ul>	<ul style="list-style-type: none"> <li>• Sleep</li> <li>• Managing Stress</li> </ul>
11	<ul style="list-style-type: none"> <li>• Meditation   Principles and Benefits<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Challenging Negative SelfTalk</li> </ul>
12	<ul style="list-style-type: none"> <li>• Weight Maintenance Skills</li> <li>• High Risk Situations   Identifying and Preparing</li> <li>• Preparing for Weight Maintenance</li> <li>• Mindful Breathing   Principles and Benefits<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Weight Maintenance Skills</li> <li>• High Risk Situations   Identifying and Preparing</li> </ul>
13	<ul style="list-style-type: none"> <li>• Staying Motivated</li> <li>• Special Occasions</li> <li>• Ensuring Your Exercise Gets Done</li> </ul>	<ul style="list-style-type: none"> <li>• Staying Motivated</li> <li>• Special Occasions</li> <li>• Ensuring Your Exercise Gets Done</li> </ul>
14	<ul style="list-style-type: none"> <li>• Setting New Goals</li> <li>• Celebration</li> </ul>	<ul style="list-style-type: none"> <li>• Setting New Goals</li> <li>• Celebration</li> </ul>

Figure 6: Flow of participants through randomized control trial (follow-up at 6 months)

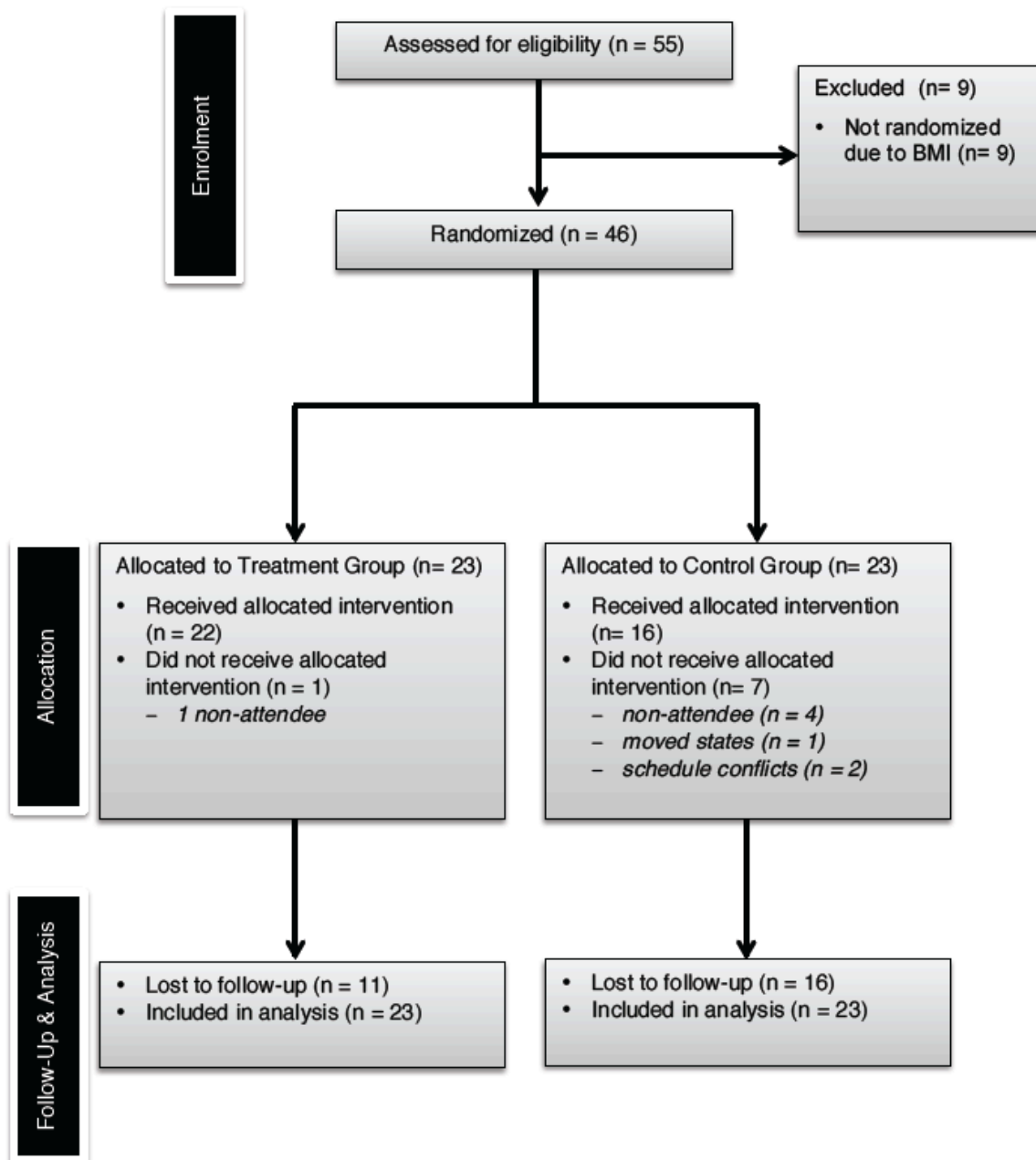


Table 15: Baseline STRENGTH study participant characteristics

Characteristics	Total (n = 46)	ST+SR Group (n = 23)	ST Group (n = 23)	p
Baseline BMI, kg/m <sup>2</sup>	46.9 (7.9)	46.0 (5.8)	47.9 (9.6)	0.43
Baseline weight, lbs. (SD)	276.3 (50.2)	268.2 (35.3)	284.4 (61.4)	0.28
Age, years	40.3 (9.0)	40.1 (9.7)	40.5 (8.6)	0.88
Educational achievement, years	17.2 (2.97)	17.2 (2.97)	17.2 (3.04)	0.97
Marital Status, No (%)				0.61
<i>Married</i>	16 (36.7)	8 (36.6)	8 (36.6)	
<i>Widowed</i>	2 (4.6)	1 (4.6)	1 (4.6)	
<i>Divorced</i>	7 (15.9)	3 (13.6)	4 (18.2)	
<i>Separated</i>	1 (2.3)	1 (4.6)	0	
<i>Never Married</i>	17 (38.6)	9 (40.9)	8 (36.6)	
<i>Living With Partner</i>	1 (2.3)	0	1 (4.6)	
Smoked 100+ Cigarettes (“No”), No (%)	8 (17.8)	6 (27.7)	2 (8.7)	0.40
Employment Status <sup>13</sup> , No (%)				0.05
<i>Working FullTime (≥ 30 hours)</i>	37 (82.2)	16 (17.7)	21 (91.3)	
<i>Working PartTime (&lt; 30 hours)</i>	4 (8.9)	3 (3.6)	1 (4.6)	
<i>Student</i>	1 (2.2)	1 (4.6)	0	

<sup>13</sup>Only one selection was permitted.

Characteristics	Total (n = 46)	ST+SR Group (n = 23)	ST Group (n = 23)	p
<i>Keeping house and/or raising children</i>	2 (4.4)	2 (9.1)	0	
<i>Retired</i>	1 (2.2)	0	1 (4.6)	
Annual Household Income, No (%)				0.04
$\leq \$19K$	3 (7.1)	3 (15.8)	0	
$\$20K \$39K$	13 (30.9)	7 (36.8)	6 (26.1)	
$\$40K \$69K$	21 (50.0)	5 (26.3)	16 (69.6)	
$\geq \$70K$	5 (11.9)	4 (21.1)	1 (4.4)	
Number of People Living in Household	2.8 (1.6)	2.6 (1.4)	2.9 (1.8)	0.39
Number of Children Living in Household	0.93 (1.1)	0.73 (1.08)	1.1 (1.0)	0.12
Binge Eating Disorder (measured with BES)	15.1 (7.7)	17.9 (8.1)	12.3 (6.3)	0.02
Night Eating Disorder (measured with NEQ)	14.0 (7.0)	14.8 (8.2)	13.3 (5.7)	0.48
Stressful Experiences in Past 12 Months (measured with GRSS)	3.5 (2.0)	2.9 (2.2)	4.1 (3.1)	0.04
Depression (measured with CES-DS)	18.6 (5.5)	17.9 (6.3)	19.2 (4.8)	0.51

Table 16: Change in primary outcome (weight) from baseline to follow-up by treatment group for STRENGTH study participants

Outcome	Baseline, kg (SD)	6 Months, kg (SD)	Change from Baseline, kg (SD)	Change from Baseline, % (SD)	p
<i>Without imputation</i>					
All (n = 19)	125.3 (22.8)	120.7 (21.9)	-3.3 (5.5)	-2.6 (4.4)	0.12
ST (n = 7)	129.0 (27.9)	124.5 (30.0)	-1.3 (4.4)	-1.0 (3.4)	0.26
ST+SR (n = 12)	121.7 (16.0)	118.5 (16.6)	-4.4 (5.9)	-3.6 (4.8)	0.56
<i>With imputation</i>					
All (n = 46)	125.3 (22.8)	123.9 (22.9)	-1.5 (3.9)	-1.2 (3.1)	0.35
ST (n = 23)	129.0 (27.9)	128.6 (27.7)	-0.40 (2.4)	-0.3 (1.9)	0.09
ST+SR (n = 23)	121.7 (16.0)	119.2 (16.2)	-2.5 (4.8)	-2.1 (3.9)	0.08

Table 17: Change in secondary outcomes from baseline to follow-up by treatment group for STRENGTH study participants

Outcome	Baseline	6 Months	Change from Baseline
<b>FTC, (SD)</b>			
All (BL, n = 44; 6M, n = 12)	13.4 (3.9)	12.0 (5.8)	-1.4
SD (BL, n = 22; 6M, n = 8)	13.0 (3.0)	14.8 (5.9)	1.8
ST+SR (BL, n = 22; 6M, n = 4)	13.9 (4.7)	10.6 (5.5)	-3.3
<b>SS-D, (SD)</b>			
All (BL, n = 10; 6M, n = 6)	61.0 (7.4)	66.3 (6.6)	5.3
SD (BL, n = 7; 6M, n = 5)	59.3 (9.1)	63.0 (7.1)	3.7
ST+SR (BL, n = 3; 6M, n = 1)	61.7 (7.2)	67.0	5.3
<b>DRA TOTAL, (SD)</b>			
All (BL, n = 42; 6M, n = 8)	22.6 (5.9)	15.9 (5.9)	-6.7
SD (BL, n = 21; 6M, n = 5)	22.4 (4.6)	20.7 (10.6)	-1.7
ST+SR (BL, n = 21; 6M, n = 3)	22.9 (7.1)	13.0 (6.8)	-9.9
<b>DRA Nuts &amp; Spreads Sub-Score, (SD)</b>			
All (BL, n = 44; 6M, n = 12)	7.6 (1.9)	4.8 (1.9)	-2.8
SD (BL, n = 22; 6M, n = 8)	7.4 (2.0)	4.5 (1.9)	-2.9
ST+SR (BL, n = 22; 6M, n = 4)	7.8 (1.8)	5.0 (2.0)	-2.8
<b>DRA Vegetables &amp; Beans Sub-Score, (SD)</b>			
All (BL, n = 44; 6M, n = 11)	7.1 (2.1)	6.1 (2.0)	-1.0
SD (BL, n = 22; 6M, n = 7)	6.9 (1.8)	7.0 (2.5)	0.1
ST+SR (BL, n = 22; 6M, n = 4)	7.3 (2.5)	5.6 (1.6)	-1.7
<b>DRA, Sugar &amp; Salt Sub-Score (SD)</b>			
All (BL, n = 44; 6M, n = 12)	4.3 (2.1)	2.4 (1.3)	-1.9
SD (BL, n = 22; 6M, n = 8)	4.6 (1.7)	3.8 (1.0)	-0.8
ST+SR (BL, n = 22; 6M, n = 4)	4.3 (2.5)	1.8 (0.9)	-2.5
<b>DRA, Fish &amp; Eggs Sub-Score (SD)</b>			
All (BL, n = 42; 6M, n = 9)	3.3 (2.0)	2.9 (2.4)	-0.4
SD (BL, n = 21; 6M, n = 6)	3.2 (2.0)	2.5 (2.5)	-0.7
ST+SR (BL, n = 21; 6M, n = 3)	3.4 (2.2)	2.2 (2.1)	-1.2
<b>SS-E, (SD)</b>			
All (BL, n = 10; 6M, n = 5)	52.4 (14.7)	54.5 (25.4)	2.1
SD (BL, n = 7; 6M, n = 2)	64.1 (17.6)	63.8 (30.8)	-0.3
ST+SR (BL, n = 3; 6M, n = 3)	47.3 (11.1)	40.5 (6.4)	-6.8
<b>TUG, (SD)</b>			
All (BL, n = 46; 6M, n = 11), seconds	9.7 (1.8)	7.9 (0.6)	-1.8
SD (BL, n = 23; 6M, n = 7), seconds	9.8 (2.2)	8.1 (0.6)	-1.7
ST+SR (BL, n = 23; 6M, n = 4), seconds	9.5 (1.3)	7.7 (0.7)	-1.8
<b>RESIDE TOTAL, (SD)</b>			
All (BL, n = 28; 6M, n = 8), minutes/week	169.6 (122.1)	608.1 (337.2)	438.5
SD (BL, n = 18; 6M, n = 5), minutes/week	120.3 (38.0)	468.3 (308.1)	348.0

Outcome	Baseline	6 Months	Change from Baseline
ST+SR (BL, n = 10; 6M, n = 3), minutes/week	179.7 (125.3)	692.0 (357.9)	512.3
<b>RESIDE WALK FOR TRANSPORT, (SD)</b>			
All (BL, n = 13; 6M, n = 5), minutes/week	70.8 (85.3)	225.0 (288.0)	154.2
SD (BL, n = 9; 6M, n = 3), minutes/week	32.5 (12.6)	52.5 (10.6)	20.0
ST+SR (BL, n = 4; 6M, n = 2), minutes/week	87.8 (99.0)	340.0 (341.2)	252.2
<b>RESIDE WALK FOR RECREATION, (SD)</b>			
All (BL, n = 18; 6M, n = 8), minutes/week	106.9 (98.6)	224.0 (166.5)	117.1
SD (BL, n = 13; 6M, n = 5), minutes/week	154.0 (162.7)	164.0 (116.4)	10.0
ST+SR (BL, n = 5; 6M, n = 3), minutes/week	88.8 (60.7)	260.0 (193.4)	171.2
<b>RESIDE VIGOROUS PA, (SD)</b>			
All (BL, n = 8; 6M, n = 5), minutes/week	116.9 (69.9)	210.0 (137.5)	93.1
SD (BL, n = 5; 6M, n = 2)	118.3 (76.5)	130.0 (42.4)	11.7
ST+SR (BL, n = 3; 6M, n = 3)	116.0 (75.0)	330.0 (113.6)	214.0
<b>RESIDE MODERATE PA, (SD)</b>			
All (BL, n = 9; 6M, n = 5), minutes/week	107.8 (107.1)	179.6 (101.9)	71.8
SD (BL, n = 6; 6M, n = 2), minutes/week	86.7 (30.6)	139.3 (105.3)	52.6
ST+SR (BL, n = 3; 6M, n = 3), minutes/week	118.3 (118.3)	240.0 (84.9)	121.7
<b>PSQ, (SD)</b>			
All (BL, n = 41; 6M, n = 11)	0.52 (0.18)	0.43 (0.23)	-0.09
SD (BL, n = 21; 6M, n = 8)	0.58 (0.14)	0.56 (0.23)	-0.02
ST+SR (BL, n = 20; 6M, n = 3)	0.48 (0.21)	0.38 (0.22)	-0.1
<b>MCMI, (SD)</b>			
All (BL, n = 43; 6M, n = 12)	7.9 (2.1)	7.3 (3.2)	-0.6
SD (BL, n = 21; 6M, n = 8)	7.1 (2.0)	7.0 (3.9)	-0.1
ST+SR (BL, n = 22; 6M, n = 4)	8.6 (2.0)	8.0 (3.9)	-0.6
<b>SRBW, (SD)</b>			
All (BL, n = 40; 6M, n = 12)	31.5 (4.7)	40.3 (7.8)	8.8
SD (BL, n = 19; 6M, n = 8)	32.1 (4.2)	38.4 (7.6)	6.3
ST+SR (BL, n = 21; 6M, n = 4)	30.8 (5.2)	44.0 (7.7)	13.2

## **CHAPTER VII: SUMMARY OF FINDINGS AND RECOMMENDATIONS FOR FUTURE RESEARCH**

### **VII.A. Summary of Findings**

African American women who are severely obese face unique weight loss challenges that are related to their body size, race/ethnicity and gender. The phenomenon known as Role Overload (RO)—which results from insufficient resources, low levels of support and experiencing barriers associated with the Multiple Caregiver Role (MCR)—and the embodiment of the Superwoman Role (SR) are significant sources of contextual stress in the lives of African American women who are severely obese. Our findings suggest that increased stress may contribute to increases in body weight through increased food coping behaviors and increased risk of engaging in disordered eating patterns such as Binge Eating Disorder (BED) and Night Eating Disorder (NED); the presence or absence of depression may also play a role. In our study, compared to their overweight/moderately obese counterparts, African American women who are severely obese were less physically active and reported diets that were lower in fruits and vegetables and higher in sugary/salty snacks.

Effective and feasible behavioral weight loss (BWL) programs are needed for African American women who are severely obese. The overarching goal of this research was to understand the specific weight loss barriers of African American women who are severely obese and then to design and evaluate the efficacy of a BWL program tailored to meet these specific needs. The findings from this dissertation research contribute to the literature concerning BWL



programs for African American women by (1) confirming and expanding the scope of the previous research done by Samuel-Hodge, Woods-Giscombe and others by exploring views of contextually defined chronic stressors—RO and SR—and their relationship to health behaviors in a specific population of African American women who are severely obese, (2) examining differences between severely obese and overweight/obese African American women with regards to selected lifestyle and psychosocial factors, including physical activity, diet, physical and mental well-being and social support, and (3) by reporting on the findings of a pilot study conducted to test impact and feasibility of a tailored BWL program for African American women who are severely obese. The sections below summarize these contributions by specific aim and discuss potential implications for current practice and future research.

#### *Aim One*

Stress plays an important role in weight management, and it is a relatively well-studied phenomenon in the-weight-disparity literature,<sup>6,55,56,188-190,273</sup> but less is known about the impact of stress in severe obesity and especially in African American women who are severely obese. The purpose of Aim One was to assess the relationship between stress and BMI in a sample of African American women who are severely obese with a focus on two contextually informed chronic stressors—RO and the SR. Data collected from both the focus group sessions and questionnaire indicated that women in our sample could identify with one or more of the three characteristics of the RO phenomenon: (1) lack of resources, (2) low levels of support, and (3) barriers associated with the MCR. With regards to the MCR, during the sessions, women identified how the sense of responsibility they felt to take care of others was a source of stress in their lives; analysis of data from the questionnaire revealed that scores assessing barriers

associated with the MCR were positively and significantly associated with perceived stress levels.

Focus group participants reported using food as a coping mechanism in response to stress. Analysis of questionnaire responses revealed that perceived stress and identification with barriers associated with the MCR were both positively and significantly associated with at least one of the food coping scales. The strong association between increased stress levels and increased preference for and consumption of high fat foods is supported by other studies with animals<sup>39</sup> and women,<sup>111,112,113</sup> including African American women.<sup>88</sup>

Although the specific term “depression” was rarely used during the actual discussions, symptoms associated with depression were frequently mentioned. Women described having no motivation and/or lacking energy to engage in physical activity and/or prepare healthy meals. As expected, increasing levels of perceived stress were highly and significantly associated with more symptoms of depression.

Of the 5 core characteristics of the SR identified by Woods-Giscombe et al.,<sup>56</sup> women most frequently discussed feeling an obligation to manifest strength. This finding was supported by questionnaire data as well. The most commonly reported stressor on the GRSS was “Being expected to be strong when no one was strong for you” (62.5% of participants reporting). In addition, on the SR stereotypes scale, the first question “Black women have to be strong to survive” received the highest score (mean 4.7 with 1 = strongly disagree to 5 = strongly agree).

Some of our results were contrary to our initial hypotheses. First, although embodiment of the SR was described as being stressful during the focus group sessions, it was not significantly associated with perceived stress based on analyses of the questionnaire data. Second, no significant associations were found between BMI and any of the potentially

moderating variables including stress, depression or the use of food coping behaviors. Our small sample size and hence, low statistical power, may have contributed to our lack of significant findings.

### *Aim Two*

Recent research suggests that individuals who are severely obese face different challenges in losing weight and hence, their needs in a BWL program may be different than those who are just overweight or obese. It is important to understand these differences so that researchers can identify opportunities for tailoring. Most of the research with individuals who are severely obese to date has been in small to moderately sized trials that study heterogeneous (with regards to both race and gender) samples, but, there is evidence from other studies that the effects of many of the factors relevant to weight loss are modified by race/ethnicity and gender.

Thus, the purpose of our cross-sectional analysis was to examine differences between severely obese and overweight/obese African American women with regards to selected lifestyle and psychosocial factors: physical activity, diet, physical and mental well-being and social support. We used baseline data from the HHL Project,<sup>274</sup> which included a total of 307 African American women. Our analyses revealed that African American women who are severely obese were different from their overweight/obese counterparts in several ways. The severely obese women in this study consumed significantly fewer servings of fruits and vegetables and significantly more servings of sugar-sweetened beverages, desserts and sugary/salty snacks. Our findings are similar to other studies that support the link between fruit and vegetable intake and consumption of refined carbohydrates and body weight.<sup>245-247</sup> However, we are unable to assess if the higher intake of sugary and salty foods is due to any type of food coping behavior like NED or BED.

Significant differences between groups were found for both types of physical activity measures—self-report and objective (via pedometer). Our results were similar to those published in a 2005 study with African American women that found that the least active women ( $\leq 5000$  steps per day) had significantly higher BMIs, percent body fat, waist circumference and hip circumference compared to their more active counterparts ( $\geq 5000$  steps per day).<sup>243</sup> The lower physical activity scores in combination with the lower Physical Composite Score (PCS) suggest that the greater risk of mobility challenges that have been seen in racially mixed populations may apply to African American women as well although this cannot be confirmed by our study. Although the dataset did not include a variable that specifically measured stress or depression, the Mental Composite Score (MCS) assessed to what degree—if at all—the respondent’s current emotional state has interfered with performing activities of daily living. MCSs were significantly lower for the severely obese women in our sample, which could suggest more symptoms of anxiety, stress or depression.

No statistically significant differences between groups were found for any of the 6 social support scales including the average number of close friends and relatives, although the scores for these scales did trend in the direction of severely obese women scoring lower for all four of the social support sub-variables. There is a broad and relatively robust literature supporting the important and positive role that social support can play in health behaviors among African Americans including diet and physical activity,<sup>60-63</sup> which are key components of a BWL program. But there is also evidence to the contrary with several cross sectional studies in mixed race populations finding no relationship between social support and body weight.

### *Aim Three*

Research on effective treatments for severe obesity should prioritize the groups who are at highest risk of becoming severely obese, in this case, African American women. The relatively exclusive focus on bariatric surgery as a treatment for severe obesity has resulted in a paucity of information on how to design BWL programs for individuals who are severely obese. Only a small handful of quality BWL program studies with individuals who are severely obese have been published<sup>142,156,249</sup> and none, to our knowledge, have been tailored to meet the needs of African American women who are severely obese.

Using findings from our literature review and formative research, we developed a BWL program that focused on the needs of African American women who are severely obese. In addition to surface-level cultural adaptations, the program incorporated deep-structure cultural modifications in the curriculum content with a particular focus on stress reduction. We compared our modified program to a standard BWL program by enrolling 46 African American women who are severely obese into a 2-arm, 6-month randomized control trial. Our primary outcome was difference in body weight between the two groups at 6-months follow-up compared using a 2-sample t-test. Results from the 2-sample t-test using ITT with baseline values carried forward found that there were no significant differences in follow-up weights between groups. However, it is possible that our small sample size and high attrition rates may have contributed to this lack of significance.

Forty-one percent of participants were lost to follow-up. Approximately half of the participants attended two or fewer sessions; of those participants, nine never attended a session. Race, BMI and socioeconomic status have all been investigated as variables that could predict attrition. Our cohort of women was relatively highly educated, and the majority were working

full-time. It is possible that work commitments were a considerable barrier to continuing with the program.

Results of a bivariate analyses on our baseline data did show a significant and relatively strong correlation between baseline BMI and mobility (higher BMI, lower mobility) as measured by the TUG test (0.54,  $p < 0.01$ ). This finding was expected given the evidence supporting the critical role that physical activity plays in weight loss.<sup>275</sup> and was supported by findings from other studies including a 2015 study by Correia et al. that found a negative and significant association between BMI and performance on the 6 Minute Walk Test among severely obese individuals.<sup>225</sup>

## **VII.B. Implications of Findings for Practice**

Results from our cross-sectional analysis of psychosocial characteristics and lifestyle behaviors of severely obese to overweight/obese African American women (Aim 2) indicated that African American women who are severely obese had poorer physical and mental health scores compared to their overweight/obese counterparts. As such, it is important for any BWL intervention to consider approaches to encouraging activities that are tailored to participant physical capabilities (such as incorporating chair exercises or aquatic activities) and to screen for and—where possible—address any psychological conditions (such as anxiety, depression, etc.) that could potentially hinder an individual's participation in a BWL program.

Furthermore, researchers designing future BWL programs for African American women who are severely obese should consider incorporating culturally informed stress-reduction components. Although our small sample size and high attrition rates prohibited us from being able to statistically determine whether the addition of stress-reduction curricula had an effect on weight loss, the program evaluations concerning the stress-reduction content that were completed

by women in the Standard Treatment + Stress Reduction group were very positive overall. Future interventions should specifically focus on helping participants reduce stress through increasing social support, improving time management skills and identifying and refuting irrational thoughts.

The high attrition rates in our study could indicate that our treatment dose—approximately 28 contact hours over 6 months—was too low for the needs of this specific group of women. Alternatively, it is also possible that the dose was sufficient but the method of contact (in-person, group and face-to-face) was not the most appropriate design for this particular population. Future BWL interventions for African American women who are severely obese should explore whether increasing the intensity of the contacts (with regards to both frequency and total contact hours) and/or modifying the type of contact (individual vs. group and/or in-person vs. phone vs. web) can improve intervention adherence and reduce attrition.

Finally, future studies with this specific population should consider allotting time very early on in the intervention for increasing awareness about the challenges of continued participation in BWL programs and for discussing strategies for overcoming them. The most common reasons reported by women in our study for discontinuing participation were: scheduling conflicts ( $n = 7$ ), health concerns (for themselves or immediate family members) ( $n = 4$ ), death in the family ( $n = 3$ ), transportation issues ( $n = 2$ ) and/or job loss ( $n = 1$ ). These findings were not surprising, as other studies with African American women have reported similar barriers to engaging in healthy lifestyle behaviors.<sup>276</sup> Raising awareness about these common barriers and discussing strategies to overcome them may increase participant motivation and self-efficacy to continue their participation in the BWL should such a scenario arise.

### **VII.C. Recommendations for Future Research**

More research is needed concerning how to tailor BWL programs to meet the needs of severely obese populations, especially those at highest risk—African American women. With only a small recruitment budget, we had over 350 women visit our website and complete the online screening questionnaire from October 2014 to March 2015 (not all of the 350 women met our enrollment criteria), and we continued to receive calls from interested individuals for several months after the enrollment period closed. There is clearly an interest in BWL programs for weight loss among African American women who are severely obese.

Specifically, researchers should continue to examine the efficacy of stress-focused, culturally tailored BWL programs for African American women. The sample size for our study and the one other published similar study conducted by Cox et al.<sup>6</sup> greatly limit the statistical power for analyzing primary outcomes and, perhaps more importantly, for exploring the potential roles of any mediating or moderating variables such as initial body weight, depression, motivation, self-efficacy, and others. In addition to increasing sample size, these future studies should also be sure to monitor treatment adherence—especially adherence to stress-reduction activities—to aid in the interpretation of both primary and secondary outcomes.

Social support remains a difficult construct to conceptualize and measure. Despite these challenges, social support remains an important topic to study with regards to health behaviors. In his recent publication in *Ethnicity and Disease*, William Wolfe calls for more research specifically in the area of social support for weight management in African American women noting that social support can enhance perceived control/self-efficacy.<sup>217</sup> Future BWL intervention research should continue to examine this construct with a focus on understanding



how to help African American women who are severely obese utilize the assets of their existing social networks to support their continual engagement in healthy lifestyle behaviors.

Finally, future research on BWL programs for African American women who are severely obese should prioritize seeking answers on how to improve participant retention and program adherence above-and-beyond adaptations that increase intervention intensity. Two aspects of BWL intervention research that empirically have merit, but are rarely if ever formally assessed are (1) interventionist rapport with participants and (2) social cohesion within groups. The relevance of both of these factors was observed in our own study; the group that seemed to have developed the strongest bonds among the group members and between group members and the interventionist had the highest attrition rates.

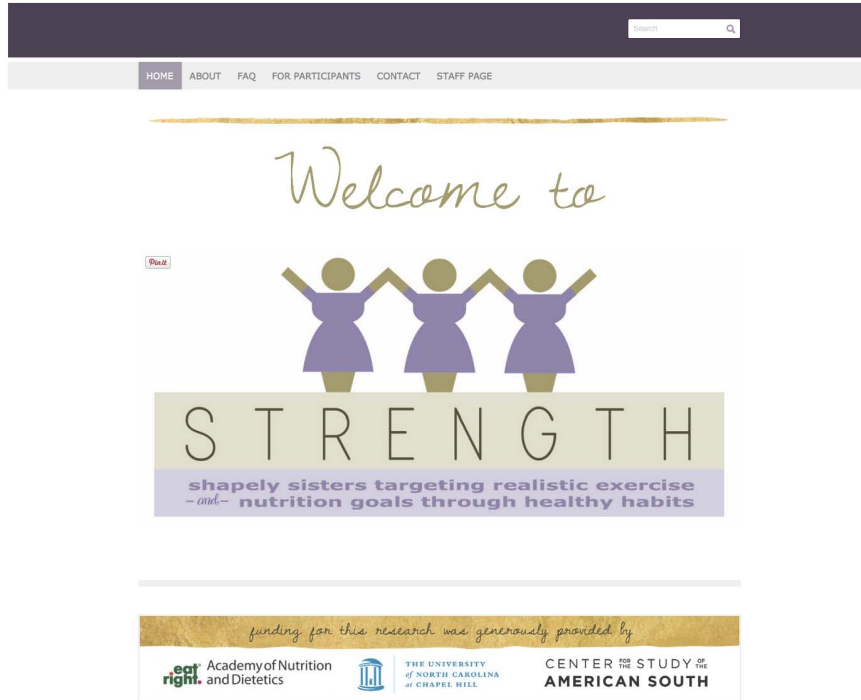
In summary, more research needs to be devoted to understanding how to improve BWL program retention and program adherence among African American women who are severely obese. The most critical questions that future research studies should address are as follows: (1) Which cultural and psychosocial variables are most relevant to consider when designing a BWL program for this specific population?; and (2) How and to what degree does the BWL program need to be modified to successfully incorporate these adaptations?

## APPENDIX I: STRENGTH STUDY BRANDING

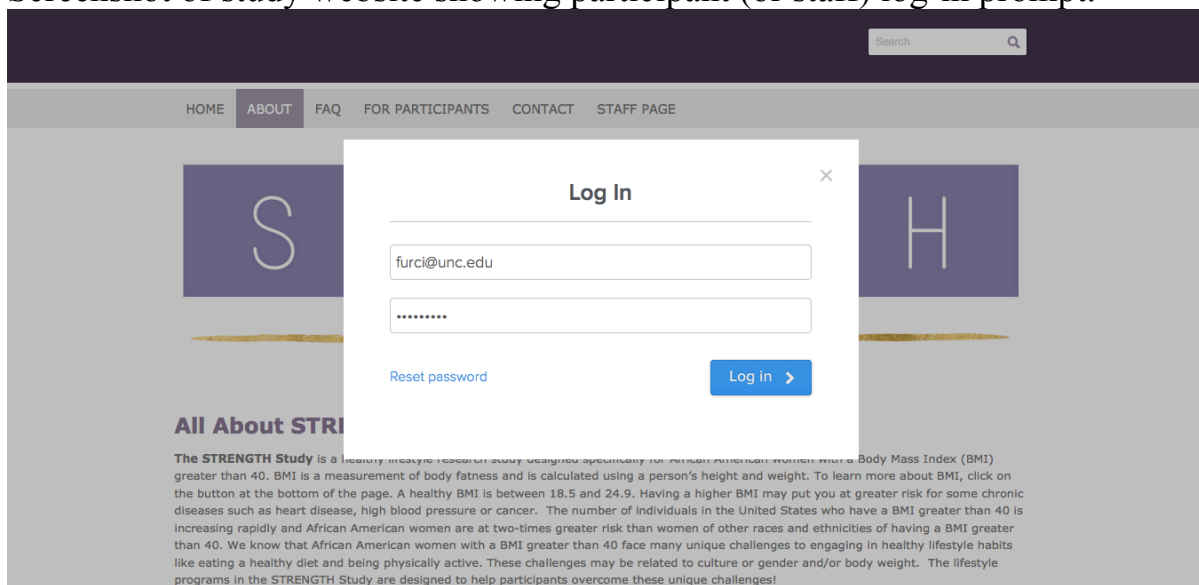


## APPENDIX II: STRENGTH STUDY WEBSITE SCREENSHOTS

Screenshot of study website homepage.



Screenshot of study website showing participant (or staff) log-in prompt.



### APPENDIX III: STRENGTH STUDY TELEVISION ADVERTISING SCREENSHOTS

#### Narrator Script

You are not alone!

Many African American women know the extra weight they are carrying around is unhealthy, but struggle to make lifestyle changes because they are overwhelmed by family expectations or feel guilty for taking time for themselves.

If this describes you, The UNC STRENGTH program may be the answer! STRENGTH is a healthy lifestyle program tailored to meet the specific needs of African American women who are 100 or more pounds overweight.

To see if you qualify or for more information visit [www.STRENGTHstudy.com](http://www.STRENGTHstudy.com).







STRENGTHtvAD

- Participation in this program is **free**
- Participants are eligible for up to **\$65** in Walmart gift cards



STRENGTH

[www.STRENGTHstudy.com](http://www.STRENGTHstudy.com)  
919-749-4248

0:21 / 0:38

STRENGTHtvAD



STRENGTH

*Now Enrolling!*

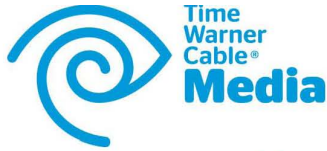
Study Begins April 2015

[www.STRENGTHstudy.com](http://www.STRENGTHstudy.com) | 919.749.4248

0:26 / 0:38

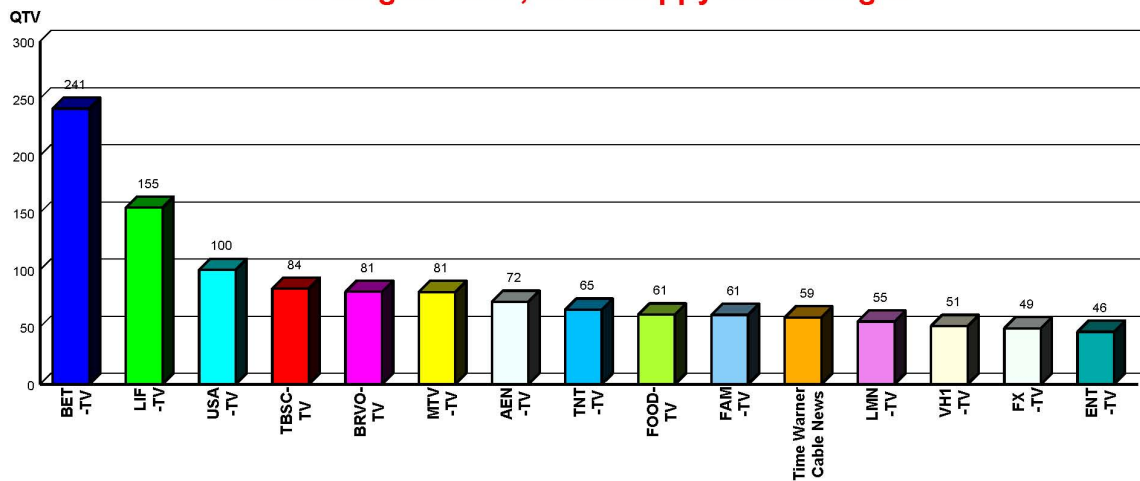


## APPENDIX IV: NETWORK RESEARCH INFORMATION FROM TELEVISION ADVERTISING COMPANY



### UNC - Strength Study

**African American Women  
Live in Orange, Chatham or Durham County  
Weight Concerns: Do Not Follow Weight Loss Program, or Bought Meds  
For Weight Loss, or Unhappy With Weight**



### Past 7 Days

Raleigh/Durham, NC-Syndicated-MRIMosaic, Oc13-Se14, Scarborough, Total Survey Area, Adults 18+

This report has been prepared using STRATA report design © copyright 2015 Strata Marketing, Inc. 1-312-222-1555.  
Scarborough Ratings Data © Copyright 2015 Scarborough Research Corporation. Scarborough Data & Reports are protected under the federal Copyright Act and are the registered intellectual property of Scarborough Research & Arbitron, Inc. Any use of the Scarborough Data is subject to all limitations and qualifications contained in the Report.



## APPENDIX V: STRENGTH STUDY LETTER AND INCENTIVE SENT TO PARTICIPANTS REGARDING FOLLOW-UP DATA COLLECTION



UNC  
CENTER FOR HEALTH  
PROMOTION AND  
DISEASE PREVENTION

THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

1700 MARTIN LUTHER KING JR. BLVD.  
CAMPUS BOX 7426  
CHAPEL HILL, NC 27599-7426

T 919.966.6080  
F 919.966.6264  
www.hdp.unc.edu

September 10, 2015

[NAME]  
[ADDRESS]  
[CITY, STATE, ZIP]

Dear Ms. [LAST NAME],

We hope this letter finds you well. As hard as it is to believe, we are nearing the conclusion of STRENGTH. We are grateful to have had each and every one of you enrolled in our study and we hope that the program has been of value to you.

Next week—the week starting with Sunday, 9/27—will be the last week of the study. We are writing today to inform you about some very important information regarding the last sessions, as they will be a quite different than the previous sessions. More details are provided below.

### When will the last sessions occur?

There will be no Wednesday night session. Instead sessions will be held on the following dates and times:  
*Monday, September 28th from 6:00 PM – 8:00 PM*  
*Saturday, October 3<sup>rd</sup>, from 11:00 AM – 2:00 PM*

### Where will the last sessions occur?

Both sessions will take place in same room in which all of the previous sessions were held (e.g. the large conference room on the 2<sup>nd</sup> floor of the UNC Center for Health Promotion and Disease Prevention.

### Do I have to stay for the entire session?

No. These sessions will be similar to a “floating reception”, meaning that you can drop by anytime you would like during the times that are listed above and your visit can be as long or as short as you desire.

### What will happen during the session?

We will have lots of refreshments for you to enjoy. Katie and Danielle will be there to congratulate you and chat with you about the study in general (what you liked vs. didn't like, etc.). We will be giving away wonderful door prizes from Created Collections ([www.createdcollections.com](http://www.createdcollections.com))! Created Collections is a local, Durham-based bath and beauty product shop that is owned by Katie's friend, Ms. Pearleen Gee. All of her creations are all-natural and undoubtedly surpass the quality of any Bath and Body Works product. Last, but not least, we will be collecting final weight and walkability measurements. The methods used to collect this data will be identical to those that you took part in at the start of the study. Completing the measurements will take less than 5 minutes of your time and you will receive a \$25 Walmart gift card the same day in appreciation for your time.

We also would like to take this opportunity to remind you of how incredibly valuable your participation in the follow-up measurement session is to the success of this study. It's important to have final information from everyone or almost everyone because that's the only way to say with certainty "here is what we found". If we don't have enough information at the end of the study, we are left guessing about what happened to those who did not show up. The more we have to guess, the less believable our findings are.

As Katie might have mentioned during your first session, we know very little about how to help African American women lose weight through lifestyle changes. The knowledge we gain through this research will be used to develop future studies aimed at helping African American women live healthier lifestyles through improved eating and physical activity behaviors. The number of sessions that you attended does not matter; it is just important for us to collect this information from all women who officially enrolled in the study. If you are unable to attend the last session, but are willing to be measured, please email me at [furci@unc.edu](mailto:furci@unc.edu) and I will do my very best to work with your schedule to find a date, time and location that is convenient for you.

As promised, all of the study materials are now posted on the website. These materials include the additional stress-reduction content that the treatment group received. To access the materials go to [www.STRENGTHstudy.com](http://www.STRENGTHstudy.com) then click on the "For Participants" tab at the top of the page. You should then see "Participant Materials" at the top of the page. Just click on the two links below to download the handouts and/or the session guides.

Thank you again for your time and participation! As always, if you have any questions or concerns, please don't hesitate to contact us anytime. We look forward to seeing you soon!

Sincerely,

**Danielle F. Braxton MPH, RD**  
Doctoral Student  
The University of North Carolina at Chapel Hill  
Nutrition Department  
[furci@unc.edu](mailto:furci@unc.edu)

**Katie Lockamy**  
STRENGTH Study Interventionist  
The University of North Carolina at Chapel Hill  
Center for Health Promotion and Disease Prevention  
[Strength.Interventionist@gmail.com](mailto:Strength.Interventionist@gmail.com)

**Carmen Samuel-Hodge MS, PhD, RD**  
Research Assistant Professor  
The University of North Carolina at Chapel Hill  
Schools of Medicine and Public Health | Department of Nutrition  
[carmen\\_samuel@unc.edu](mailto:carmen_samuel@unc.edu)



## APPENDIX VI: STRENGTH STUDY ONLINE BASELINE QUESTIONNAIRE (A SELECTION OF 3 SCREENSHOTS)



### Welcome



Thank you for agreeing to take part in this study. The following survey contains approximately 200 questions and should take you about 1 hour to complete. The questions will ask you about your: (1) diet and exercise habits, (2) stress levels, (3) moods and (4) attitudes and beliefs regarding female stereotypes. You may choose not to answer any question on the survey for any reason.

You do not need to complete the survey in one sitting. By simply closing the tab on your Internet browser your answers will be saved. To return to complete the survey, simply click on the link provided in the email.

If you have any questions or concerns, please email us at **strength\_study@unc.edu**. Click on the arrow ( >> ) in the bottom right corner to start the survey.

*Funding for this research has been provided by*



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL



Academy of Nutrition  
and Dietetics

CENTER FOR STUDY OF  
THE  
AMERICAN SOUTH

## SECTION 1: Contact Information and Demographics

### Section 1: All About You



## Demographics

### Section 1: All About You (1 of 15)

What is your name?

Last Name

First Name

Middle Initial

**Section 1: All About You** (2 of 15)

Where do you live?

Street Address	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Zip Code	<input type="text"/>

**Section 1: All About You** (2 of 15)

Is your mailing address the same as your street address?

- ☐ Yes
- ☐ No

**Section 1: All About You** (2 of 15)

What is your **mailing** address?

Street Address	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Zip Code	<input type="text"/>

**Section 1: All About You** (3 of 15)

What are your home, cell and work phone numbers?

Home Phone	<input type="text"/>
Cell Phone	<input type="text"/>
Work Phone	<input type="text"/>

## APPENDIX VII: MEASUREMENT TOOLS USED IN THE QUESTIONNAIRES DISCUSSED IN CHAPTERS IV AND VI

### Sallis Social Support for Diet Scale<sup>277</sup>

#### SOCIAL SUPPORT AND EATING HABITS SURVEY

Below is a list of things people might do or say to someone who is trying to improve their eating habits. We are interested in high fat and high salt (or high sodium) foods. If you are not trying to make any of these dietary changes, then some of the questions may not apply to you, but please read and give an answer to every question.

Please rate each question *twice*. Under *family*, rate how often anyone living in your household has said or done what is described during the last three months. Under *friends*, rate how often your friends, acquaintances, or coworkers have said or done what is described during the last three months.

Please write *one* number from the following rating scale in each space:

#### SAMPLE:

A. If my family <i>rarely</i> makes fun of the foods I eat, and my friends <i>very often</i> do, I would answer like this:	<b>Family</b>		<b>Friends</b>	
A. Made fun of the foods I eat	A. <u>2</u>		A. <u>5</u>	

none	rarely	a few times	often	very often	does not apply
1	2	3	4	5	8

During the past three months, my family (or members of my household) or friends:

	Family		Friends	
1. Encouraged me not to eat "unhealthy foods" (cake, salted chips) when I'm tempted to do so.	1.		1.	
2. Discussed my eating habit. changes with me (asked me how I'm doing with my eating changes).	2.		2.	
3. Reminded me not to eat high fat, high salt foods.	3.		3.	
4. Complimented me on changing my eating habits ("Keep it up", "We are proud of you") .	4.		4.	
5. Commented if I went back to my old eating habits.	5.		5.	
6. Ate high fat or high salt foods in front of me.	6.		6.	
7. Refused to eat the same foods I eat.	7.		7.	
8. Brought home foods I'm trying not to eat.	8.		8.	
9. Got angry when I encouraged them to eat low salt, low fat foods.	9.		9.	
10. Offered me food I'm trying not to eat.	10.		10.	

## Sallis Social Support for Exercise Scale<sup>277</sup>

### SOCIAL SUPPORT AND EXERCISE SURVEY

Below is a list of things people might do or say to someone who is trying to exercise regularly. If you are not trying to exercise, then some of the questions may not apply to you, but please read and give an answer to every question.

Please rate each question *twice*. Under *family*, rate how often anyone living in your household has said or done what is described during the last three months. Under *friends*, rate how often your friends, acquaintances, or coworkers have said or done what is described during the last three months.

Please write *one* number from the following rating scale in each space:

none	rarely	a few times	often	very often	does not apply
1	2	3	4	5	8

During the past three months, my family (or members of my household) or friends:

	Family	Friends
11. Exercised with me.	11. _____	11. _____
12. Offered to exercise with me.	12. _____	12. _____
13. Gave me helpful reminders to exercise ("Are you going to exercise tonight?").	13. _____	13. _____
14. Gave me encouragement to stick with my exercise program.	14. _____	14. _____
15. Changed their schedule so we could exercise together.	15. _____	15. _____
16. Discussed exercise with me.	16. _____	16. _____
17. Complained about the time I spend exercising.	17. _____	17. _____
18. Criticized me or made fun of me for exercising.	18. _____	18. _____
19. Gave me rewards for exercising (bought me something or gave me something I like).	19. _____	19. _____
20. Planned for exercise on recreational outings.	20. _____	20. _____
21. Helped plan activities around my exercise.	21. _____	21. _____
22. Asked me for ideas on how <i>they</i> can get more exercise.	22. _____	22. _____
23. Talked about how much they like to exercise.	23. _____	23. _____

---

<input type="checkbox"/> 1. English <input type="checkbox"/> 2. Spanish		Date: Entered <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/>	Office Use Only	Coder: <input type="text"/> <input type="text"/>
---	--	---	-----------------	--

---

September 26, 1986



---

**Table 1. Multiple care-giving measurement instrument\***

---

1. Helping friends and family makes me feel good.
  2. Being available for family and friends is important to me.
  3. Friends and family come to me for help and support.
  4. I believe it is my calling to help my family and friends.
  5. Friends and family come to me for help with their problems.
  6. I always place my family's needs ahead of my own.
  7. Taking care of family and friends interferes with caring for myself.
  8. Having to take care of family and friends causes me stress.
  9. It's hard to say "no" when friends and family come to me for help.
  10. I feel obligated to help my family and friends.
  11. Caring for family and friends is a burden on my life.
  12. How many people would you say regularly depend on you for help and support or regularly talk to you about their problems?
- 

\* Responses for items 1–11: four-point Likert scale—disagree a lot, disagree a little, agree a little, agree a lot.  
Responses for item 12:  $\leq 2$ ; 3–5; 6–8;  $> 8$ .

MC-Role scale: 6 items (1–5, 10); MC-Barriers scale: 3 items (7, 8, 11).

---

### Stereotypic Roles for Black Women Scale<sup>199</sup>

This is a scale to determine attitudes and beliefs. There are no right or wrong answers. Please use the following scale to complete the questions.

1-Strongly Disagree

2-Disagree

3-Undecided

4-Agree

5-Strongly Agree

1. Black women are often loud and obnoxious. 1 2 3 4 5
2. Black women are all about sex. 1 2 3 4 5
3. Black women have to be strong to survive. 1 2 3 4 5
4. Black women need to nag others to get a response. 1 2 3 4 5
5. Black women will use sex to get what they want. 1 2 3 4 5
6. Men can be controlled with sex. 1 2 3 4 5
7. If given a chance, Black women will put down Black men. 1 2 3 4 5
8. Black women are often treated as sex objects. 1 2 3 4 5
9. I am often expected to take care of family members. 1 2 3 4 5
10. If I fall apart, I will be a failure. 1 2 3 4 5
11. Black women are usually angry with others. 1 2 3 4 5
12. I often put aside my own needs to help others. 1 2 3 4 5
13. I often feel ignored by others. 1 2 3 4 5
14. I find it difficult to ask others for help. 1 2 3 4 5
15. I feel guilty when I put my own needs before others. 1 2 3 4 5
16. I do not want others to know if I experience a problem. 1 2 3 4 5

17. People often expect me to take care of them. 1 2 3 4 5
18. People respond to me more if I am loud and angry. 1 2 3 4 5
19. I tell others that I am fine when I am depressed or down. 1 2 3 4 5
20. People treat me as if I am a sex object. 1 2 3 4 5
21. It is difficult for me to share problems with others. 1 2 3 4 5
22. I should not expect nurturing from others. 1 2 3 4 5
23. I am hardly ever satisfied. 1 2 3 4 5
24. Black women are out to get your man. 1 2 3 4 5
25. I often have to put someone in their place, read them, or check them. 1 2 3 4 5
26. Young Black women are gold-diggers. 1 2 3 4 5
27. I often threaten to cuss someone out. 1 2 3 4 5
28. Sex is a weapon. 1 2 3 4 5
29. I am overworked, overwhelmed, and/or underappreciated. 1 2 3 4 5
30. Black women are demanding. 1 2 3 4 5
31. I am always helping someone else. 1 2 3 4 5
32. I will let people down if I take time out for myself. 1 2 3 4 5
33. It is easy for me to tell other people my problems. 1 2 3 4 5
34. I feel guilty if I cannot help someone. 1 2 3 4 5

NOTE:

“Mammy” Stereotype: items 12, 15, 17, 22, 34

“Superwoman” Stereotype: items 3, 9, 10, 14, 16, 19, 21, 29, 31, 32, 33 (reverse-coded)

“Sapphire” Stereotype: items 1, 4, 7, 11, 13, 18, 23, 25, 27, 30

“Jezebel” Stereotype: items 2, 5, 6, 8, 20, 24, 26, 28

# Perceived Stress Questionnaire Index<sup>196</sup>

32

S. LEVENSTEIN *et al.*

26. KISS A, NEMESKERI N, MARITESCH F, *et al.* Stressful life events and acute relapse of Crohn's disease. *Psychosom Med* 1991; **53**: 215–227.
27. PEUGH DG. The influence of emotional factors on the clinical course of ulcerative colitis in children. *Gastroenterology* 1951; **18**: 339–354.
28. NORTH CS, CLOUSE RE, SPITZNAGEL EL, ALPERS DH. The relation of ulcerative colitis to psychiatric factors: A review of findings and methods. *Am J Psychiat* 1990; **147**: 974–981.
29. NORTH CS, ALPERS DH, HELZER JE, SPITZNAGEL EL, CLOUSE RE. Do life events or depression exacerbate inflammatory bowel disease? A prospective study. *Ann Int Med* 1991; **114**: 381–386.
30. DUFFY LC, ZIELEZNY MA, MARSHALL JR, *et al.* Lag time between stress events and risk of recurrent episodes of inflammatory bowel disease. *Epidemiology* 1991; **2**: 141–145.
31. STEPTOE A. The links between stress and illness. *J Psychosom Res* 1991; **35**: 633–644.
32. COHEN S, TYRRELL DAJ, SMITH AP. Psychological stress and susceptibility to the common cold. *New Engl J Med* 1991; **325**: 606–612.
33. NEMIAH JC. Alexithymia and psychosomatic illness. *JCE Psychiatry* 1978; 25–37.
34. BRADLEY C. Sex differences in reporting and rating of life events: A comparison of diabetic and healthy subjects. *J Psychosom Res* 1980; **24**: 35–37.

## APPENDIX

### *The Perceived Stress Questionnaire*

#### *Instructions for the General questionnaire*

For each sentence, circle the number that describes how often it applies to you in general, *during the last year or two*. Work quickly, without bothering to check your answers, and be careful to describe your life *in the long run*.

	Almost never	Sometimes	Often	Usually
1. You feel rested	1	2	3	4
2. You feel that too many demands are being made on you	1	2	3	4
3. You are irritable or grouchy	1	2	3	4
4. You have too many things to do	1	2	3	4
5. You feel lonely or isolated	1	2	3	4
6. You find yourself in situations of conflict	1	2	3	4
7. You feel you're doing things you really like	1	2	3	4
8. You feel tired	1	2	3	4
9. You fear you may not manage to attain your goals	1	2	3	4
10. You feel calm	1	2	3	4
11. You have too many decisions to make	1	2	3	4
12. You feel frustrated	1	2	3	4
13. You are full of energy	1	2	3	4
14. You feel tense	1	2	3	4
15. Your problems seem to be piling up	1	2	3	4
16. You feel you're in a hurry	1	2	3	4
17. You feel safe and protected	1	2	3	4
18. You have many worries	1	2	3	4
19. You are under pressure from other people	1	2	3	4
20. You feel discouraged	1	2	3	4
21. You enjoy yourself	1	2	3	4
22. You are afraid for the future	1	2	3	4
23. You feel you're doing things because you have to not because you want to	1	2	3	4
24. You feel criticized or judged	1	2	3	4
25. You are lighthearted	1	2	3	4
26. You feel mentally exhausted	1	2	3	4
27. You have trouble relaxing	1	2	3	4
28. You feel loaded down with responsibility	1	2	3	4
29. You have enough time for yourself	1	2	3	4
30. You feel under pressure from deadlines	1	2	3	4

#### *Instructions for the Recent questionnaire*

For each sentence, circle the number that describes how often it applied to you *during the last month*. Work quickly, without bothering to check your answers, and be careful to consider *only the last month*.

Score 5—circled number for items 1, 7, 10, 13, 17, 21, 25, 29

Score circled number for all other items

PSQ Index = (raw score–30)/90.

Table 1. CES-D Scale

---

INSTRUCTIONS FOR QUESTIONS: Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week. HAND CARD A.

Rarely or None of the Time (Less than 1 Day)

Some or a Little of the Time (1-2 Days)

Occasionally or a Moderate Amount of Time (3-4 Days)

Most or All of the Time (5-7 Days)

---

During the past week:

1. I was bothered by things that usually don't bother me.
  2. I did not feel like eating; my appetite was poor.
  3. I felt that I could not shake off the blues even with help from my family or friends.
  4. I felt that I was just as good as other people.
  5. I had trouble keeping my mind on what I was doing.
  6. I felt depressed.
  7. I felt that everything I did was an effort.
  8. I felt hopeful about the future.
  9. I thought my life had been a failure.
  10. I felt fearful.
  11. My sleep was restless.
  12. I was happy.
  13. I talked less than usual.
  14. I felt lonely.
  15. People were unfriendly.
  16. I enjoyed life.
  17. I had crying spells.
  18. I felt sad.
  19. I felt that people dislike me.
  20. I could not get "going."
- 

reported elsewhere (Comstock & Helsing, in press), as are analyses of characteristics of those who refused to be interviewed (Comstock & Helsing, 1973; Klassen & Roth, 1974). Refusals were significantly more likely to have lower education and come from smaller households than respondents. Analyses have been made of respondents interviewed in the assigned week ("on time") versus the harder to find respondents interviewed in the following three weeks ("late") (Mebane, 1973). Males and working people were slightly overrepresented among the "late" respondents, but the "late" did not differ from the "on time" on the psychological measures in the

interview, including the *CES-D* scale. The samples probably have some underrepresentation of males and the poorly educated. However, they include respondents with a wide range of demographic characteristics, in numbers adequate for analyses of relationships among variables.

#### Second Questionnaire Survey (Q2 Survey)

The *CES-D* scale was also included in a slightly revised (mainly shortened) version of the questionnaire (Q2) used in Washington County only, from March 1973 through July 1974 (for three months Q1 and Q2 were used alternately). Sam-

aimed at loosening excessive controls actually has helped promote increased feelings of personal efficacy. Another treatment approach called Overeaters Anonymous has been developed based on very different assumptions. The treatment is a self-help approach derived from the Alcoholic Anonymous model, and encourages group members to adopt a belief that they are powerless to control inappropriate eating urges. The program also includes the use of a "food-sponsor," a fellow group member who helps the participant plan their meals each day. Here, the person is encouraged to use external control both behaviorally, through food sponsors, and cognitively, by belief in a higher power to strengthen a person's weak will. More individualized obesity treatment to meet the unique needs of binge eaters does appear justified, yet specific methods need to be further studied.

While obese persons were of interest in this paper, several important diagnostic questions pertain to other groups. Bruch (1978) claimed that anorexics frequently engage in eating binges. What are similarities and differences of binge eating for obese vs. anorexic persons? Do normal weight persons engage in eating binges? Does the binge eating of bulimarexics, observed among college-aged females, represent an early sign of an obesity-prone individual?

*Acknowledgement*—This project was supported by a grant from the National Institutes of Child Health and Human Development. The cooperation of the participants and interviewers is gratefully acknowledged. Aaron Altschul permitted data collection at the Georgetown University Weight Management Clinic. Ray Hawkins made helpful comments on an earlier draft. Jo Shaffer prepared the manuscript. Interviewer rating manuals are available from Jim Gormally, Department of Psychology, University of Maryland, College Park, MD 20742.

#### REFERENCE NOTE

1. Cummings, C. *Binge eating: Extending the parameters of addiction*. Paper presented at the Association for Advancement of Behavior Therapy, San Francisco, 1979.

#### REFERENCES

- Bandura, A. Self-efficacy: Towards a unifying theory of behavioral change. *Psychological Review*, 1977, 84, 191-215.
- Bruch, H. *The Golden Cage*. Cambridge: Harvard University Press, 1978.
- Diagnostic and Statistical Manual of Mental Disorders*. Washington, D.C.: American Psychiatric Association, 1979.
- Gormally, J., Rardin, D., & Black, S. Correlates of successful response to a behavioral weight control clinic. *Journal of Counseling Psychology*, 1980, 27, 179-191.
- Hawkins, R.C., & Clement, P. Development and construct validation of a self-report measure of binge eating tendencies. *Addictive Behaviors*, 1980, 5, 219-226.
- Mahoney, K., & Mahoney, M.J. Cognitive factors in weight reduction. J.D. Krumboltz and C.E. Thoresen (Eds.), *Counseling methods*. New York: Holt, Rinehart and Winston, 1976.
- Mariatt, G.A. A cognitive-behavioral model of the relapse process. N.A. Krasnegor (Ed.), *Behavioral analysis and treatment of substance abuse*. N.I.D.A. Research Monographs 25, Department of Health, Education, and Welfare, 1979.
- Orbach, S. Social dimensions in compulsive eating in women. *Psychotherapy: Theory, Research and Practice*, 1978, 15, 180-189.
- Stunkard, A.J. Eating patterns of obese persons. *Psychiatric Quarterly*, 1959, 33, 284-292.
- Wilson, G.T. Obesity, binge eating, and behavior therapy: Some clinical observations. *Behavior Therapy*, 1976, 7, 700.
- Wooley, S.C., Wooley, O.W., & Dyrenforth, S.R. Obesity treatment reexamined: The case for a more tentative and experimental approach. In N.A. Krasnegor (Ed.), *Behavioral analysis and treatment of substance abuse*. N.I.D.A. Research Monograph 25, Department of Health, Education, and Welfare, 1979.

#### APPENDIX A: BINGE EATING SCALE

*Note.* The scoring weights are in parentheses next to each statement. Total scale score is the sum of the weights for the 16 items.

*Eating habits checklist*

*Instructions.* Below are groups of numbered statements. Read all of the statements in each group and mark on this sheet the one that best describes the way you feel about the problems you have controlling your eating behavior.

## #1

- (0) 1. I don't feel self-conscious about my weight or body size when I'm with others.
- (0) 2. I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.
- (1) 3. I do get self-conscious about my appearance and weight which makes me feel disappointed in myself.
- (3) 4. I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.

## #2

- (0) 1. I don't have any difficulty eating slowly in the proper manner.
- (1) 2. Although I seem to "gobble down" foods, I don't end up feeling stuffed because of eating too much.
- (2) 3. At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.
- (3) 4. I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I've eaten too much.

## #3

- (0) 1. I feel capable to control my eating urges when I want to.
- (1) 2. I feel like I have failed to control my eating more than the average person.
- (3) 3. I feel utterly helpless when it comes to feeling in control of my eating urges.
- (3) 4. Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

## #4

- (0) 1. I don't have the habit of eating when I'm bored.
- (0) 2. I sometimes eat when I'm bored, but often I'm able to "get busy" and get my mind off food.
- (0) 3. I have a regular habit of eating when I'm bored, but occasionally, I can use some other activity to get my mind off eating.
- (2) 4. I have a strong habit of eating when I'm bored. Nothing seems to help me break the habit.

## #5

- (0) 1. I'm usually physically hungry when I eat something.
- (1) 2. Occasionally, I eat something on impulse even though I really am not hungry.
- (2) 3. I have the regular habit of eating foods, that I might not really enjoy, to satisfy a hungry feeling even though physically, I don't need the food.
- (3) 4. Even though I'm not physically hungry, I get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth. Sometimes, when I eat the food to satisfy my mouth hunger, I then spit the food out so I won't gain weight.

#6

- (0) 1. I don't feel any guilt or self-hate after I overeat.
- (1) 2. After I overeat, occasionally I feel guilt or self-hate.
- (3) 3. Almost all the time I experience strong guilt or self-hate after I overeat.

#7

- (0) 1. I don't lose total control of my eating when dieting even after periods when I overeat.
- (2) 2. Sometimes when I eat a "forbidden food" on a diet, I feel like I "blew it" and eat even more.
- (3) 3. Frequently, I have the habit of saying to myself, "I've blown it now, why not go all the way" when I overeat on a diet. When that happens I eat even more.
- (3) 4. I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a "feast" or "famine."

#8

- (0) 1. I rarely eat so much food that I feel uncomfortably stuffed afterwards.
- (1) 2. Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
- (2) 3. I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
- (3) 4. I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

#9

- (0) 1. My level of calorie intake does not go up very high or go down very low on a regular basis.
- (1) 2. Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I've eaten.
- (2) 3. I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening.
- (3) 4. In my adult years, I have had week-long periods where I practically starve myself. This follows periods when I overeat. It seems I live a life of either "feast or famine."

#10

- (0) 1. I usually am able to stop eating when I want to. I know when "enough is enough."
- (1) 2. Every so often, I experience a compulsion to eat which I can't seem to control.
- (2) 3. Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
- (3) 4. I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

#11

- (0) 1. I don't have any problem stopping eating when I feel full.
- (1) 2. I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.



- (2) 3. I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
- (3) 4. Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

## #12

- (0) 1. I seem to eat just as much when I'm with others (family, social gatherings) as when I'm by myself.
- (1) 2. Sometimes, when I'm with other persons, I don't eat as much as I want to eat because I'm self-conscious about my eating.
- (2) 3. Frequently, I eat only a small amount of food when others are present, because I'm very embarrassed about my eating.
- (3) 4. I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a "closet eater."

## #13

- (0) 1. I eat three meals a day with only an occasional between meal snack.
- (0) 2. I eat 3 meals a day, but I also normally snack between meals.
- (2) 3. When I am snacking heavily, I get in the habit of skipping regular meals.
- (3) 4. There are regular periods when I seem to be continually eating, with no planned meals.

## #14

- (0) 1. I don't think much about trying to control unwanted eating urges.
- (1) 2. At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.
- (2) 3. I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
- (3) 4. It seems to me that most of my waking hours are pre-occupied by thoughts about eating *or* not eating. I feel like I'm constantly struggling not to eat.

## #15

- (0) 1. I don't think about food a great deal.
- (1) 2. I have strong cravings for food but they last only for brief periods of time.
- (2) 3. I have days when I can't seem to think about anything else but food.
- (3) 4. Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.

## #16

- (0) 1. I usually know whether or not I'm physically hungry. I take the right portion of food to satisfy me.
- (1) 2. Occasionally, I feel uncertain about knowing whether or not I'm physically hungry. At these times it's hard to know how much food I should take to satisfy me.
- (2) 3. Even though I might know how many calories I should eat, I don't have any idea what is a "normal" amount of food for me.

# Night Eating Questionnaire<sup>278</sup>

Directions: Please circle ONE answer for each question.

1. How hungry are you usually in the morning?  

0	1	2	3	4
Not at all	A little	Somewhat	Moderately	Very
2. When do you usually eat for the first time?  

0	1	2	3	4
Before 9am	9:01 to 12pm	12:01 to 3pm	3:01 to 6pm	6:01 or later
3. Do you have cravings or urges to eat snacks after supper, but before bedtime?  

0	1	2	3	4
Not at all	A little	Somewhat	Very much so	Extremely so
4. How much control do you have over your eating between supper and bedtime?  

0	1	2	3	4
None at all	A little	Some	Very much	Complete
5. How much of your daily food intake do you consume after suppertime?  

0	1	2	3	4
0%	1-25%	26-50%	51-75%	76-100%
(none)	(up to a quarter)	(about half)	(more than half)	(almost all)
6. Are you currently feeling blue or down in the dumps?  

0	1	2	3	4
Not at all	A little	Somewhat	Very much so	Extremely
7. When you are feeling blue, is your mood lower in the:  

0	1	2	3	4
Early morning	Late morning	Afternoon	Early evening	Late Evening /nighttime

\_\_\_\_\_ check here if your mood does not change during the day
8. How often do you have trouble getting to sleep?  

0	1	2	3	4
Never	Sometimes	About half the time	Usually	Always
9. Other than only to use the bathroom, how often do you get up at least once in the middle of the night?  

0	1	2	3	4
Never	Less than once a week	About once a week	More than once a week	Every night

\*\*\*\*\* IF 0 on #9, PLEASE STOP HERE \*\*\*\*\*

10. Do you have cravings or urges to eat snacks when you wake up at night?  
0 1 2 3 4  
Not at all A little Somewhat Very much so Extremely so
11. Do you need to eat in order to get back to sleep when you awake at night?  
0 1 2 3 4  
Not at all A little Somewhat Very much so Extremely so
12. When you get up in the middle of the night, how often do you snack?  
0 1 2 3 4  
Never Sometimes About half Usually Always  
the time

\*\*\*\*\* IF 0 on #12, PLEASE SKIP TO # 15 \*\*\*\*\*

13. When you snack in the middle of the night, how aware are you of your eating?  
0 1 2 3 4  
Not at all A little Somewhat Very much so Completely
14. How much control do you have over your eating while you are up at night?  
0 1 2 3 4  
None at all A little Some Very much Complete
15. How long have your current difficulties with night eating been going on?  
\_\_\_\_\_ mos. \_\_\_\_\_ years
16. Is your night eating upsetting to you?  
0 1 2 3 4  
Not at all A little Somewhat Very much so Extremely
17. How much has your night eating affected your life?  
0 1 2 3 4  
Not at all A little Somewhat Very much so Extremely

### **SCORING KEY FOR THE *NIGHT EATING QUESTIONNAIRE (NEQ)***

A. Items 1, 4 and 14 are reverse scored. Items 1-12 and 14 are summed.

B. Item 13 is not included in the total score, but is used to rule out the parasomnia, Nocturnal Sleep Related Eating Disorder (NS-RED).

C. Item 15 is not added to the total score, but instead is used as a descriptor of the course of the symptoms.

A score of 25 or greater is suggestive of night eating syndrome, and a score of 30 and above is a strong indicator of NES, but we suggest that the answers are reviewed with the patient in an interview before a firm diagnosis is made. For example, many patients with night eating symptoms over-estimate their intake at night. Also, if patients are depressed in the late evening and have trouble falling asleep, but only minimal night eating, this could inflate their scores.

NEQ Citation: Allison, K. C., Stunkard, A. J., & Thier, S. L. (2004). *Overcoming Night Eating Syndrome*. Oakland, CA: New Harbinger.

Name: \_\_\_\_\_

## Neighborhood PA Questionnaire

### Section A: Walking

In this section we ask you about two types of walking: **walking for transportation** (e.g., to the store or work), then **walking for recreation, health and fitness**. If the walking that you do for transportation is also for recreation, health or fitness, please report it only once.

#### For example:

Linda lives 20 minutes away from work. She chooses to walk there rather than drive mainly because she wants to improve her fitness. If Linda records that she walks for transportation (3 times per week for a total of 120 minutes), she would not repeat that information under walking for recreation, health or fitness.

1. In a **usual week**, do you walk to get to or from somewhere (such as walking to a store or bus stop) or for recreation, health or fitness (including walking your dog)?

☐ yes ☐ no → if no, skip to Section B

#### Walking for Transportation

2. In a **usual week**, how many times do you walk as a **means of transportation**, such as going to and from work, walking to the store, or walking to a bus stop?

→ if 0, skip to Q. 5

3. Please estimate the total time you spend walking as a **means of transportation** in a **usual week**. (e.g., 5 times by 10 minutes = 50 minutes)

hours

minutes

4. Let me know which of the following places you walk to as a **means of transportation** in a **usual week**. [Mark all that apply.]

☐ to or from work (or study)

☐ to or from friend's house

☐ to or from bus stop

☐ other place #1 → \_\_\_\_\_

☐ to or from store

☐ to or from restaurant

☐ other place #2 → \_\_\_\_\_

**Walking for Recreation, Health or Fitness:**

**If you have already reported recreational walking, please do not report it again for the following questions.**

5. In a **usual week**, how many times do you walk for **recreation, health** or **fitness** (including walking your dog)?

--	--

→ **if 0, skip to Section B**

6. Please estimate the total time you spend walking for **recreation, health** or **fitness** in a **usual week**.  
(e.g., 5 times by 10 minutes = 50 minutes)

--	--

hours

--	--	--	--

minutes

7. Could you tell me where you walk for **recreation, health** or **fitness** in a **usual week**?

- ☐ park ☐ fitness center  
☐ neighborhood ☐ other place #1 → \_\_\_\_\_  
☐ school  
☐ to or from restaurant ☐ other place #2 → \_\_\_\_\_  
☐ to or from a store

**Section B: Other Leisure Time Physical Activities**

The next set of questions is about **other leisure time physical activities** that you do for in a **usual week**, besides what you have already mentioned. Do not include walking.

8. In a **usual week**, do you do any other vigorous or moderate intensity leisure time physical activities? Do not include any walking.

☐ yes ☐ no → **Skip to Q. 16**

9. Could you tell me where you do these leisure time physical activities in a **usual week**?

- ☐ park                      ☐ other place #1 → \_\_\_\_\_  
☐ neighborhood                      \_\_\_\_\_  
☐ school                      ☐ other place #2 → \_\_\_\_\_  
☐ fitness center                      \_\_\_\_\_

10. In a **usual week**, do you do any vigorous intensity leisure time physical activities like jogging, aerobics, swimming laps, or competitive tennis? Do not include walking or moderate intensity physical activities. Vigorous intensity physical activities cause a large increase in breathing and heart rate.

☐ yes    ☐ no → *if no, skip Q. 13*

11. In a **usual week**, how many times do you do vigorous intensity leisure time physical activities which cause a large increase in breathing and heart rate?

--	--

 → *if 0, skip to Q. 13*

12. What do you estimate is the total time you spend doing vigorous intensity leisure time physical activities in a **usual week**.  
(e.g., 3 times by 20 minutes = 60 minutes)

--	--

--	--	--

  
*hours*                      *minutes*

13. Apart from what you have already mentioned, in a **usual week** do you do any other moderate intensity leisure time physical activities like dancing, cycling, social tennis, golf, or gardening? Moderate intensity physical activities cause a moderate increase in breathing and heart rate.

☐ yes    ☐ no → *if no, skip to Q. 16*

14. In a **usual week**, how many times do you do moderate intensity leisure time physical activities which cause a moderate increase in breathing and heart rate?

--	--

 → *if 0, skip to Q. 16*

15. What do you estimate is the total time you spend doing moderate intensity leisure time physical activities in a **usual week**?  
(e.g., 1 time for 1 hour = 1 hour)

--	--

*hours*

--	--	--

*minutes*

16. How confident are you that you could exercise more if you wanted to? Would you say you are **very confident**, **somewhat confident**, or **not at all confident**?

- ☐ very confident
- ☐ somewhat confident
- ☐ not at all confident
- ☐ [don't know]
- ☐ [refused]



## REFERENCES

1. Sturm R. Increases in morbid obesity in the USA: 2000-2005. *Public health*. Jul 2007;121(7):492-496.
2. Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of Obesity Among Adults and Youth: United States, 2011-2014. *NCHS data brief*. Nov 2015(219):1-8.
3. West DS, Elaine Prewitt T, Bursac Z, Felix HC. Weight loss of black, white, and Hispanic men and women in the Diabetes Prevention Program. *Obesity (Silver Spring, Md.)*. Jun 2008;16(6):1413-1420.
4. Stolley MR, Fitzgibbon ML, Schiffer L, et al. Obesity reduction black intervention trial (ORBIT): six-month results. *Obesity (Silver Spring, Md.)*. Jan 2009;17(1):100-106.
5. Wadden TA, West DS, Delahanty L, et al. The Look AHEAD study: a description of the lifestyle intervention and the evidence supporting it. *Obesity (Silver Spring, Md.)*. May 2006;14(5):737-752.
6. Cox TL, Krukowski R, Love SJ, et al. Stress Management-Augmented Behavioral Weight Loss Intervention for African American Women: A Pilot, Randomized Controlled Trial. *Health education & behavior : the official publication of the Society for Public Health Education*. Apr 13 2012.
7. Weerts SE, Amoran A. Pass the fruits and vegetables! A community-university-industry partnership promotes weight loss in African American women. *Health promotion practice*. Mar 2011;12(2):252-260.
8. Djuric Z, Mirasolo J, Kimbrough L, et al. A pilot trial of spirituality counseling for weight loss maintenance in African American breast cancer survivors. *Journal of the National Medical Association*. Jun 2009;101(6):552-564.
9. Stolley MR, Sharp LK, Oh A, Schiffer L. A weight loss intervention for African American breast cancer survivors, 2006. *Preventing chronic disease*. Jan 2009;6(1):A22.
10. Banks-Wallace J. Outcomes from Walk the Talk: a nursing intervention for Black women. *The ABNF journal : official journal of the Association of Black Nursing Faculty in Higher Education, Inc.* Winter 2007;18(1):19-24.
11. Walcott-McQuigg JA, Chen SP, Davis K, Stevenson E, Choi A, Wangsrikhun S. Weight loss and weight loss maintenance in African-American women. *Journal of the National Medical Association*. Aug 2002;94(8):686-694.

12. Domel SB, Alford BB, Cattlett HN, Gench BE. Weight control for black women. *Journal of the American Dietetic Association*. Mar 1992;92(3):346-348.
13. McNabb WL, Quinn MT, Rosing L. Weight loss program for inner-city black women with non-insulin-dependent diabetes mellitus: PATHWAYS. *Journal of the American Dietetic Association*. Jan 1993;93(1):75-77.
14. Parker VG, Coles C, Logan BN, Davis L. The LIFE project: a community-based weight loss intervention program for rural African American women. *Family & community health*. Apr-Jun 2010;33(2):133-143.
15. Kanders BS, Ullmann-Joy P, Foreyt JP, et al. The black American lifestyle intervention (BALI): the design of a weight loss program for working-class African-American women. *Journal of the American Dietetic Association*. Mar 1994;94(3):310-312.
16. Glass JN, Miller WC, Szymanski LM, Fernhall B, Durstine JL. Physiological responses to weight-loss intervention in inactive obese African-American and Caucasian women. *The Journal of sports medicine and physical fitness*. Mar 2002;42(1):56-64.
17. Nicklas BJ, Dennis KE, Berman DM, Sorkin J, Ryan AS, Goldberg AP. Lifestyle intervention of hypocaloric dieting and walking reduces abdominal obesity and improves coronary heart disease risk factors in obese, postmenopausal, African-American and Caucasian women. *The journals of gerontology. Series A, Biological sciences and medical sciences*. Feb 2003;58(2):181-189.
18. Annesi JJ. Relations of changes in exercise self-efficacy, physical self-concept, and body satisfaction with weight changes in obese white and African American women initiating a physical activity program. *Ethnicity & disease*. Winter 2007;17(1):19-22.
19. Karanja N, Stevens VJ, Hollis JF, Kumanyika SK. Steps to soulful living (steps): a weight loss program for African-American women. *Ethnicity & disease*. Summer 2002;12(3):363-371.
20. Riva G, Bacchetta M, Cesa G, et al. Is severe obesity a form of addiction? Rationale, clinical approach, and controlled clinical trial. *Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society*. Aug 2006;9(4):457-479.
21. Amato S, Colajanni E, Averna MR, et al. [Diet and psychological therapy in a group of severely obese patients]. *Minerva endocrinologica*. Jul-Sep 1990;15(3):219-221.
22. Pedersen JO, Zimmermann E, Stallknecht BM, et al. [Lifestyle intervention in the treatment of severe obesity]. *Ugeskrift for laeger*. Jan 9 2006;168(2):167-172.

23. Sanchez-Roman S, Lopez-Alvarenga JC, Vargas-Martinez A, et al. [Prevalence of psychiatric disorders in patients with severe obesity waiting for bariatric surgery]. *Revista de investigacion clinica; organo del Hospital de Enfermedades de la Nutricion*. Jul-Aug 2003;55(4):400-406.
24. Muller A, Claes L, Mitchell JE, Fischer J, Horbach T, de Zwaan M. Binge eating and temperament in morbidly obese prebariatric surgery patients. *European eating disorders review : the journal of the Eating Disorders Association*. Jan 2012;20(1):e91-95.
25. Ryden A, Sullivan M, Torgerson JS, Karlsson J, Lindroos AK, Taft C. Severe obesity and personality: a comparative controlled study of personality traits. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. Dec 2003;27(12):1534-1540.
26. Hakala P, Karvetti RL, Ronnema T. Group vs. individual weight reduction programmes in the treatment of severe obesity--a five year follow-up study. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. Feb 1993;17(2):97-102.
27. Jakobsen GS, Hofso D, Roislien J, Sandbu R, Hjelmessaeth J. Morbidly obese patients--who undergoes bariatric surgery? *Obesity surgery*. Aug 2010;20(8):1142-1148.
28. Hauck K, Hollingsworth B. The impact of severe obesity on hospital length of stay. *Medical care*. Apr 2010;48(4):335-340.
29. Petribu K, Ribeiro ES, Oliveira FM, et al. [Binge eating disorder in a population of morbid obese candidates to bariatric surgery at the Oswaldo Cruz University Hospital in Recife, PE]. *Arquivos brasileiros de endocrinologia e metabologia*. Oct 2006;50(5):901-908.
30. Pathi A, Esen U, Hildreth A. A comparison of complications of pregnancy and delivery in morbidly obese and non-obese women. *Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology*. Aug 2006;26(6):527-530.
31. Yancey AK, Ortega AN, Kumanyika SK. Effective recruitment and retention of minority research participants. *Annual review of public health*. 2006;27:1-28.
32. Fitzgibbon ML, Tussing-Humphreys LM, Porter JS, Martin IK, Odoms-Young A, Sharp LK. Weight loss and African-American women: a systematic review of the behavioural weight loss intervention literature. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Mar 2012;13(3):193-213.

33. Shavers-Hornaday VL, Lynch CF, Burmeister LF, Torner JC. Why are African Americans under-represented in medical research studies? Impediments to participation. *Ethnicity & health*. Mar-Jun 1997;2(1-2):31-45.
34. Woods-Giscombe CL, Lobel M. Race and gender matter: a multidimensional approach to conceptualizing and measuring stress in African American women. *Cultural diversity & ethnic minority psychology*. Jul 2008;14(3):173-182.
35. Pleis JR, Lethbridge-Cejku M. Summary health statistics for U.S. adults: National Health Interview Survey, 2005. *Vital and health statistics. Series 10, Data from the National Health Survey*. Dec 2006(232):1-153.
36. Walcott-McQuigg JA. The relationship between stress and weight-control behavior in African-American women. *Journal of the National Medical Association*. Jun 1995;87(6):427-432.
37. Mullings L. Minority women, work, and health. *Double exposure: Women's health hazards on the job and at home*. 1984:121-138.
38. James DC. Weight loss strategies used by African American women: possible implications for tailored messages. *Journal of human nutrition and dietetics : the official journal of the British Dietetic Association*. Jul 19 2012.
39. Greeno CG, Wing RR. Stress-induced eating. *Psychological bulletin*. May 1994;115(3):444-464.
40. Lazarus RS, Folkman S. *Stress, Appraisal and Coping*. New York, NY: Springer Publishing Company, Inc.; 1984.
41. Wagner JA, Osborn CY, Mendenhall EA, Budris LM, Belay S, Tennen HA. Beliefs about racism and health among African American women with diabetes: a qualitative study. *Journal of the National Medical Association*. Mar 2011;103(3):224-232.
42. Erdwins CJ, Buffardi LC, Casper WJ, O'Brien AS. The Relationship of Women's Role Strain to Social Support, Role Satisfaction, and Self-Efficacy\*. *Family Relations*. 2001;50(3):230-238.
43. Burchfield S. Stress: An integrative framework. *Stress: Psychological and physiological interactions*. 1985:381-394.
44. Clark VR, Harrell JP. The relationship among Type A behavior, styles used in coping with racism, and blood pressure. *Journal of Black Psychology*. 1982;8(2):89-99.

45. Hotta K, Nakata Y, Matsuo T, et al. Variations in the FTO gene are associated with severe obesity in the Japanese. *Journal of human genetics*. 2008;53(6):546-553.
46. Mwendwa DT, Gholson G, Sims RC, et al. Coping with perceived racism: a significant factor in the development of obesity in African American women? *Journal of the National Medical Association*. Jul 2011;103(7):602-608.
47. West LM, Roxanne A. Donovan, and Lizabeth Roemer. Coping With Racism: What Works and Doesn't Work for Black Women? *Journal of Black Psychology* 2010;26(3):331 - 349.
48. McEwen BS. Protective and damaging effects of stress mediators. *The New England journal of medicine*. Jan 15 1998;338(3):171-179.
49. Bjorntorp P. Do stress reactions cause abdominal obesity and comorbidities? *Obesity reviews : an official journal of the International Association for the Study of Obesity*. May 2001;2(2):73-86.
50. Lundberg U. Stress hormones in health and illness: the roles of work and gender. *Psychoneuroendocrinology*. Nov 2005;30(10):1017-1021.
51. Epel ES, McEwen B, Seeman T, et al. Stress and body shape: stress-induced cortisol secretion is consistently greater among women with central fat. *Psychosomatic Medicine*. 2000;62(5):623-632.
52. Moyer AE, Rodin J, Grilo CM, Cummings N, Larson LM, Rebuff  -Scrive M. Stress-Induced Cortisol Response and Fat Distribution in Women. *Obesity research*. 1994;2(3):255-262.
53. Barnett RC, Baruch GK. Women's involvement in multiple roles and psychological distress. *Journal of personality and social psychology*. Jul 1985;49(1):135-145.
54. Samuel-Hodge CD, Headen SW, Skelly AH, et al. Influences on day-to-day self-management of type 2 diabetes among African-American women: spirituality, the multi-caregiver role, and other social context factors. *Diabetes care*. Jul 2000;23(7):928-933.
55. Moore-Greene GM, Gross SM, Silver KD, Perrino CS. Chronic stress and decreased physical exercise: impact on weight for African American women. *Ethnicity & disease*. Spring 2012;22(2):185-191.
56. Woods-Giscombe CL. Superwoman schema: African American women's views on stress, strength, and health. *Qualitative health research*. May 2010;20(5):668-683.

57. Lynch CS, Chang JC, Ford AF, Ibrahim SA. Obese African-American women's perspectives on weight loss and bariatric surgery. *Journal of general internal medicine*. Jul 2007;22(7):908-914.
58. Carter-Edwards L, Skelly AH, Cagle CS, Appel SJ. "They care but don't understand": family support of African American women with type 2 diabetes. *The Diabetes educator*. May-Jun 2004;30(3):493-501.
59. Beauboeuf-Lafontant T. You Have to Show Strength An Exploration of Gender, Race, and Depression. *Gender & Society*. 2007;21(1):28-51.
60. Komar-Samardzija M, Braun LT, Keithley JK, Quinn LT. Factors associated with physical activity levels in African-American women with type 2 diabetes. *Journal of the American Academy of Nurse Practitioners*. Apr 2012;24(4):209-217.
61. Debnam K, Holt CL, Clark EM, Roth DL, Southward P. Relationship between religious social support and general social support with health behaviors in a national sample of African Americans. *Journal of behavioral medicine*. Apr 2012;35(2):179-189.
62. Kumanyika SK, Wadden TA, Shults J, et al. Trial of family and friend support for weight loss in African American adults. *Archives of internal medicine*. Oct 26 2009;169(19):1795-1804.
63. Harley AE, Katz ML, Heaney CA, et al. Social support and companionship among active African American women. *American journal of health behavior*. Nov-Dec 2009;33(6):673-685.
64. Thoits PA. Mechanisms linking social ties and support to physical and mental health. *Journal of health and social behavior*. Jun 2011;52(2):145-161.
65. Sarason IG, Pierce GR, Sarason BR. Social support and interactional processes: A triadic hypothesis. *Journal of Social and Personal Relationships*. 1990;7(4):495-506.
66. Flores-Gomez I, Bacardi-Gascon M, Armendariz-Anguiano AL, Perez-Morales ME, Jimenez-Cruz A. [Evidence of social support as therapy for weight loss: a systematic review]. *Nutricion hospitalaria : organo oficial de la Sociedad Espanola de Nutricion Parenteral y Enteral*. Sep-Oct 2012;27(5):1422-1428.
67. Livhits M, Mercado C, Yermilov I, et al. Is social support associated with greater weight loss after bariatric surgery?: a systematic review. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Feb 2011;12(2):142-148.

68. Strom JL, Egede LE. The impact of social support on outcomes in adult patients with type 2 diabetes: a systematic review. *Current diabetes reports*. Dec 2012;12(6):769-781.
69. Barber FD. Social support and physical activity engagement by cancer survivors. *Clinical journal of oncology nursing*. Jun 1 2012;16(3):E84-98.
70. Thoits PA. Social support as coping assistance. *Journal of consulting and clinical psychology*. Aug 1986;54(4):416-423.
71. Ford ME, Tilley BC, McDonald PE. Social support among African-American adults with diabetes. Part 1: Theoretical framework. *Journal of the National Medical Association*. Jun 1998;90(6):361-365.
72. Boothe AS, Brouwer RJ, Carter-Edwards L, Ostbye T. Unmet social support for healthy behaviors among overweight and obese postpartum women: results from the Active Mothers Postpartum Study. *Journal of women's health (2002)*. Nov 2011;20(11):1677-1685.
73. Krans EE, Chang JC. A will without a way: barriers and facilitators to exercise during pregnancy of low-income, African American women. *Women & health*. Nov 30 2011;51(8):777-794.
74. Samuel-Hodge CD, Cene CW, Corsino L, Thomas C, Svetkey LP. Family Diabetes Matters: A View from the Other Side. *Journal of general internal medicine*. Oct 5 2012.
75. Siefert K, Heflin CM, Corcoran ME, Williams DR. Food insufficiency and physical and mental health in a longitudinal survey of welfare recipients. *Journal of health and social behavior*. Jun 2004;45(2):171-186.
76. Schulz AJ, Israel BA, Zenk SN, et al. Psychosocial stress and social support as mediators of relationships between income, length of residence and depressive symptoms among African American women on Detroit's eastside. *Social science & medicine (1982)*. Jan 2006;62(2):510-522.
77. Krieger N. Embodying inequality: a review of concepts, measures, and methods for studying health consequences of discrimination. *International journal of health services : planning, administration, evaluation*. 1999;29(2):295-352.
78. Wadden TA, Butryn ML, Sarwer DB, et al. Comparison of psychosocial status in treatment-seeking women with class III vs. class I-II obesity. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Mar-Apr 2006;2(2):138-145.

79. Crerand CE, Wadden TA, Sarwer DB, et al. A comparison of weight histories in women with class III vs. class I-II obesity. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Mar-Apr 2006;2(2):165-170.
80. Jack DC. *Silencing the self: Women and depression*. HarperCollins; 1993.
81. Brown AC, Brody GH, Stoneman Z. Rural Black women and depression: A contextual analysis. *Journal of Marriage and Family*. 2000;62(1):187-198.
82. McGrath EE, Keita GPE, Strickland BR, Russo NFE. *Women and depression: Risk factors and treatment issues: Final report of the American Psychological Association's National Task Force on Women and Depression*. American Psychological Association; 1990.
83. Collins PH. *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Psychology Press; 2000.
84. Stack C. *All our kin: Strategies for survival in a black community*. Basic Books; 1975.
85. Rohm Young D, Voorhees CC. Personal, social, and environmental correlates of physical activity in urban African-American women. *American journal of preventive medicine*. Oct 2003;25(3 Suppl 1):38-44.
86. Bruce B, Agras WS. Binge eating in females: A population-based investigation. *International Journal of Eating Disorders*. 1992;12(4):365-373.
87. Taylor JY, Caldwell CH, Baser RE, Faison N, Jackson JS. Prevalence of eating disorders among Blacks in the National Survey of American Life. *The International journal of eating disorders*. Nov 2007;40 Suppl:S10-14.
88. Brown SC, Geiselman PJ, Broussard T. Cardiovascular risk in African American women attending historically Black colleges and universities: the role of dietary patterns and food preferences. *Journal of health care for the poor and underserved*. Nov 2010;21(4):1184-1193.
89. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart Disease and Stroke Statistics—2012 Update A Report From the American Heart Association. *Circulation*. 2012;125(1):e2-e220.
90. Prevalence of fruit and vegetable consumption and physical activity by race/ethnicity--United States, 2005. *MMWR. Morbidity and mortality weekly report*. Apr 6 2007;56(13):301-304.



91. Jakicic JM. The effect of physical activity on body weight. *Obesity (Silver Spring, Md.)*. Dec 2009;17 Suppl 3:S34-38.
92. Ainsworth BE, Wilcox S, Thompson WW, Richter DL, Henderson KA. Personal, social, and physical environmental correlates of physical activity in African-American women in South Carolina. *American journal of preventive medicine*. Oct 2003;25(3 Suppl 1):23-29.
93. Association AP. *Diagnostic and statistical manual of mental disorders, 5th edition (DSM-V)*. Arlington, VA2013.
94. Pumariega AJ, Gustavson CR, Gustavson JC, Motes PS, Ayers S. Eating attitudes in African-American women: The Essence eating disorders survey. *Eating disorders*. 1994;2(1):5-16.
95. Harrington EF, Crowther JH, Shipherd JC. Trauma, binge eating, and the "strong Black woman". *Journal of consulting and clinical psychology*. Aug 2010;78(4):469-479.
96. Fabricatore AN, Wadden TA, Sarwer DB, et al. Self-reported eating behaviors of extremely obese persons seeking bariatric surgery: a factor analytic approach. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Mar-Apr 2006;2(2):146-152.
97. Loro AD, Jr., Orleans CS. Binge eating in obesity: preliminary findings and guidelines for behavioral analysis and treatment. *Addictive behaviors*. 1981;6(2):155-166.
98. Gormally J, Black S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. *Addictive behaviors*. 1982;7(1):47-55.
99. Marcus MD, Wing RR, Lamparski DM. Binge eating and dietary restraint in obese patients. *Addictive behaviors*. 1985;10(2):163-168.
100. Telch CF, Agras WS, Rossiter EM. Binge eating increases with increasing adiposity. *International Journal of Eating Disorders*. 1988;7(1):115-119.
101. Vander Wal JS. Night eating syndrome: a critical review of the literature. *Clin Psychol Rev*. Feb 2012;32(1):49-59.
102. Malpede CZ, Greene LE, Fitzpatrick SL, et al. Racial influences associated with weight-related beliefs in African American and Caucasian women. *Ethnicity & disease*. Winter 2007;17(1):1-5.

103. Striegel-Moore RH, Dohm FA, Hook JM, Schreiber GB, Crawford PB, Daniels SR. Night eating syndrome in young adult women: prevalence and correlates. *The International journal of eating disorders*. Apr 2005;37(3):200-206.
104. Cleator J, Abbott J, Judd P, Sutton C, Wilding JP. Night eating syndrome: implications for severe obesity. *Nutrition & Diabetes*. 2012;2:e44.
105. Colles SL, Dixon JB, O'Brien PE. Night eating syndrome and nocturnal snacking: association with obesity, binge eating and psychological distress. *International journal of obesity (2005)*. Nov 2007;31(11):1722-1730.
106. Iacovino JM, Gredysa DM, Altman M, Wilfley DE. Psychological treatments for binge eating disorder. *Curr Psychiatry Rep*. Aug 2012;14(4):432-446.
107. Yanovski SZ, Leet M, Yanovski JA, et al. Food selection and intake of obese women with binge-eating disorder. *The American journal of clinical nutrition*. 1992;56(6):975-980.
108. Dalle Grave R, Calugi S, Ruocco A, Marchesini G. Night eating syndrome and weight loss outcome in obese patients. *The International journal of eating disorders*. Mar 2011;44(2):150-156.
109. Yanovski SZ, Gormally JF, Leser MS, Gwirtsman HE, Yanovski JA. Binge Eating Disorder Affects Outcome of Comprehensive Very-Low-Calorie Diet Treatment. *Obesity research*. 1994;2(3):205-212.
110. Sharma S, Cao X, Arcan C, et al. Assessment of dietary intake in an inner-city African American population and development of a quantitative food frequency questionnaire to highlight foods and nutrients for a nutritional intervention. *International journal of food sciences and nutrition*. 2009;60 Suppl 5:155-167.
111. Oliver G, Wardle J. Perceived effects of stress on food choice. *Physiology & behavior*. May 1999;66(3):511-515.
112. Laitinen J, Ek E, Sovio U. Stress-related eating and drinking behavior and body mass index and predictors of this behavior. *Preventive medicine*. Jan 2002;34(1):29-39.
113. Grunberg NE, Straub RO. The role of gender and taste class in the effects of stress on eating. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 1992;11(2):97-100.
114. Schiffman SS, Graham BG, Sattely-Miller EA, Peterson-Dancy M. Elevated and sustained desire for sweet taste in african-americans: a potential factor in the

- development of obesity. *Nutrition (Burbank, Los Angeles County, Calif.)*. Oct 2000;16(10):886-893.
115. Rankins J, Wortham J, Brown LL. Modifying soul food for the Dietary Approaches to Stop Hypertension diet (DASH) plan: implications for metabolic syndrome (DASH of Soul). *Ethnicity & disease*. Summer 2007;17(3 Suppl 4):S4-7-12.
  116. Wilbur J, Chandler P, Dancy B, Choi J, Plonczynski D. Environmental, policy, and cultural factors related to physical activity in urban, African American women. *Women & health*. 2002;36(2):17-28.
  117. Patt MR, Lane AE, Finney CP, Yanek LR, Becker DM. Body image assessment: comparison of figure rating scales among urban Black women. *Ethnicity & disease*. Winter 2002;12(1):54-62.
  118. Perez M, Joiner TE, Jr. Body image dissatisfaction and disordered eating in black and white women. *The International journal of eating disorders*. Apr 2003;33(3):342-350.
  119. Wiklund M, Olsen MF, Willen C. Physical activity as viewed by adults with severe obesity, awaiting gastric bypass surgery. *Physiotherapy research international : the journal for researchers and clinicians in physical therapy*. Nov 9 2010.
  120. Hergenroeder AL, Wert DM, Hile ES, Studenski SA, Brach JS. Association of body mass index with self-report and performance-based measures of balance and mobility. *Physical therapy*. Aug 2011;91(8):1223-1234.
  121. Martin-Sierra A, Vancampfort D, Probst M, et al. Walking capacity is associated with health related quality of life and physical activity level in patients with schizophrenia: a preliminary report. *Actas espanolas de psiquiatria*. Jul-Aug 2011;39(4):211-216.
  122. King WC, Engel SG, Elder KA, et al. Walking capacity of bariatric surgery candidates. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Jan-Feb 2012;8(1):48-59.
  123. Kueht ML, McFarlin BK, Lee RE. Severely obese have greater LPS-stimulated TNF-alpha production than normal weight African-American women. *Obesity (Silver Spring, Md.)*. Mar 2009;17(3):447-451.
  124. Berg K. Genetics of coronary heart disease. *Progress in medical genetics*. 1983;5:35-90.
  125. Plomin R. The role of inheritance in behavior. *Science (New York, N.Y.)*. Apr 13 1990;248(4952):183-188.

126. Huth PJ, Fulgoni VL, 3rd, Keast DR, Park K, Auestad N. Major food sources of calories, added sugars, and saturated fat and their contribution to essential nutrient intakes in the U.S. diet: data from the national health and nutrition examination survey (2003--2006). *Nutrition journal*. Aug 8 2013;12(1):116.
127. Sjostrom LV. Mortality of severely obese subjects. *The American journal of clinical nutrition*. Feb 1992;55(2 Suppl):516S-523S.
128. Sjostrom LV. Morbidity of severely obese subjects. *The American journal of clinical nutrition*. Feb 1992;55(2 Suppl):508S-515S.
129. Bronfenbrenner U. Toward an experimental ecology of human development. *American psychologist*. 1977;32(7):513.
130. Centers for Disease Control and Prevention NCfIPaC, Division of Violence Prevention. 2015; <http://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html>.
131. Trayhurn P, Wood IS. Adipokines: inflammation and the pleiotropic role of white adipose tissue. *The British journal of nutrition*. Sep 2004;92(3):347-355.
132. Ogden CL, Carroll MD, Flegal KM. Prevalence of obesity in the United States. *JAMA : the journal of the American Medical Association*. Jul 2014;312(2):189-190.
133. Kershaw EE, Flier JS. Adipose tissue as an endocrine organ. *The Journal of clinical endocrinology and metabolism*. Jun 2004;89(6):2548-2556.
134. Fryar CD, Carroll MD, Ogden CL. Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2009–2010. *Hyattsville, MD: National Center for Health Statistics*. 2012.
135. Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. *Journal of health economics*. Jan 2012;31(1):219-230.
136. Cawley J, Rizzo JA, Haas K. Occupation-specific absenteeism costs associated with obesity and morbid obesity. *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine*. Dec 2007;49(12):1317-1324.
137. Andreyeva T, Sturm R, Ringel JS. Moderate and severe obesity have large differences in health care costs. *Obesity research*. Dec 2004;12(12):1936-1943.

138. Freedman DS, Khan LK, Serdula MK, Galuska DA, Dietz WH. Trends and correlates of class 3 obesity in the United States from 1990 through 2000. *JAMA : the journal of the American Medical Association*. Oct 9 2002;288(14):1758-1761.
139. Koh HK, Piotrowski JJ, Kumanyika S, Fielding JE. Healthy people: a 2020 vision for the social determinants approach. *Health education & behavior : the official publication of the Society for Public Health Education*. Dec 2011;38(6):551-557.
140. Flegal KM, Carroll MD, Kit BK, Ogden CL. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA : the journal of the American Medical Association*. Feb 1 2012;307(5):491-497.
141. Buchwald H, Estok R, Fahrenbach K, Banel D, Sledge I. Trends in mortality in bariatric surgery: a systematic review and meta-analysis. *Surgery*. Oct 2007;142(4):621-632; discussion 632-625.
142. Goodpaster BH, Delany JP, Otto AD, et al. Effects of diet and physical activity interventions on weight loss and cardiometabolic risk factors in severely obese adults: a randomized trial. *JAMA : the journal of the American Medical Association*. Oct 27 2010;304(16):1795-1802.
143. O'Meara S, Riemsma R, Shirran L, Mather L, ter Riet G. A systematic review of the clinical effectiveness of orlistat used for the management of obesity. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Feb 2004;5(1):51-68.
144. O'Neil PM, Smith SR, Weissman NJ, et al. Randomized placebo-controlled clinical trial of lorcaserin for weight loss in type 2 diabetes mellitus: the BLOOM-DM study. *Obesity (Silver Spring, Md.)*. Jul 2012;20(7):1426-1436.
145. Fidler MC, Sanchez M, Raether B, et al. A one-year randomized trial of lorcaserin for weight loss in obese and overweight adults: the BLOSSOM trial. *The Journal of clinical endocrinology and metabolism*. Oct 2011;96(10):3067-3077.
146. Smith SR, Weissman NJ, Anderson CM, et al. Multicenter, placebo-controlled trial of lorcaserin for weight management. *The New England journal of medicine*. Jul 15 2010;363(3):245-256.
147. McDuffie JR, Calis KA, Uwaifo GI, et al. Efficacy of orlistat as an adjunct to behavioral treatment in overweight African American and Caucasian adolescents with obesity-related co-morbid conditions. *Journal of pediatric endocrinology & metabolism : JPEM*. Mar 2004;17(3):307-319.

148. Livingston EH, Ko CY. Socioeconomic characteristics of the population eligible for obesity surgery. *Surgery*. Mar 2004;135(3):288-296.
149. Martin M, Beekley A, Kjorstad R, Sebesta J. Socioeconomic disparities in eligibility and access to bariatric surgery: a national population-based analysis. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Jan-Feb 2010;6(1):8-15.
150. Turner PL, Oyetunji TA, Gantt G, Chang DC, Cornwell EE, Fullum TM. Demographically associated variations in outcomes after bariatric surgery. *American journal of surgery*. Apr 2011;201(4):475-480.
151. Jensen MD, Ryan DH, Apovian CM, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Journal of the American College of Cardiology*. Jul 1 2014;63(25 Pt B):2985-3023.
152. Buddeberg-Fischer B, Klaghofer R, Krug L, et al. Physical and psychosocial outcome in morbidly obese patients with and without bariatric surgery: a 4 1/2-year follow-up. *Obesity surgery*. Mar 2006;16(3):321-330.
153. van Gemert WA, van der Palen J, Monninkhof EM, et al. Quality of Life after Diet or Exercise-Induced Weight Loss in Overweight to Obese Postmenopausal Women: The SHAPE-2 Randomised Controlled Trial. *PloS one*. 2015;10(6):e0127520.
154. Terranova CO, Brakenridge CL, Lawler SP, Eakin EG, Reeves MM. Effectiveness of lifestyle-based weight loss interventions for adults with type 2 diabetes: A systematic review and meta-analysis. *Diabetes, obesity & metabolism*. Dec 19 2014.
155. Pi-Sunyer X, Blackburn G, Brancati FL, et al. Reduction in weight and cardiovascular disease risk factors in individuals with type 2 diabetes: one-year results of the look AHEAD trial. *Diabetes care*. Jun 2007;30(6):1374-1383.
156. Samaha FF, Iqbal N, Seshadri P, et al. A low-carbohydrate as compared with a low-fat diet in severe obesity. *The New England journal of medicine*. May 22 2003;348(21):2074-2081.
157. McManus K, Antinoro L, Sacks F. A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. Oct 2001;25(10):1503-1511.

158. Shai I, Schwarzfuchs D, Henkin Y, et al. Weight loss with a low-carbohydrate, Mediterranean, or low-fat diet. *The New England journal of medicine*. Jul 17 2008;359(3):229-241.
159. Willett W. *Eat, drink, and be healthy: the Harvard Medical School guide to healthy eating*. Simon and Schuster; 2011.
160. Sanchez-Villegas A, Martinez-Gonzalez MA, Estruch R, et al. Mediterranean dietary pattern and depression: the PREDIMED randomized trial. *BMC Med*. 2013;11:208.
161. Babio N, Toledo E, Estruch R, et al. Mediterranean diets and metabolic syndrome status in the PREDIMED randomized trial. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne*. Nov 18 2014;186(17):E649-657.
162. de Lorgeril M. PREDIMED trial: Mediterranean diet may reduce the risk of type 2 diabetes. *Evidence-based medicine*. Oct 2011;16(5):152-153.
163. Neiberg RH, Wing RR, Bray GA, et al. Patterns of weight change associated with long-term weight change and cardiovascular disease risk factors in the Look AHEAD Study. *Obesity (Silver Spring, Md.)*. Oct 2012;20(10):2048-2056.
164. Krause MV. *Food, nutrition and diet therapy*. Saunders; 1979.
165. Mifflin MD, St Jeor ST, Hill LA, Scott BJ, Daugherty SA, Koh YO. A new predictive equation for resting energy expenditure in healthy individuals. *The American journal of clinical nutrition*. Feb 1990;51(2):241-247.
166. Abraham C, Michie S. A taxonomy of behavior change techniques used in interventions. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. May 2008;27(3):379-387.
167. Nigg CR, Allegrante JP, Ory M. Theory-comparison and multiple-behavior research: common themes advancing health behavior research. *Health education research*. Oct 2002;17(5):670-679.
168. Young MD, Plotnikoff RC, Collins CE, Callister R, Morgan PJ. A Test of Social Cognitive Theory to Explain Men's Physical Activity During a Gender-Tailored Weight Loss Program. *American journal of men's health*. Aug 14 2015.
169. Stacey FG, James EL, Chapman K, Courneya KS, Lubans DR. A systematic review and meta-analysis of social cognitive theory-based physical activity and/or nutrition behavior change interventions for cancer survivors. *Journal of cancer survivorship : research and practice*. Jun 2015;9(2):305-338.

170. Jekauc D, Volkle M, Wagner MO, Mess F, Reiner M, Renner B. Prediction of attendance at fitness center: a comparison between the theory of planned behavior, the social cognitive theory, and the physical activity maintenance theory. *Frontiers in psychology*. 2015;6:121.
171. Glanz K, Rimer BK, Viswanath K. *Health behavior and health education: theory, research, and practice*. John Wiley & Sons; 2008.
172. Kreuter MW, Skinner CS. Tailoring: what's in a name? *Health education research*. Feb 2000;15(1):1-4.
173. Kreuter MW, Skinner CS, Steger-May K, et al. Responses to behaviorally vs culturally tailored cancer communication among African American women. *American journal of health behavior*. May-Jun 2004;28(3):195-207.
174. Whitt MC, Kumanyika SK. Tailoring counseling on physical activity and inactivity for African-American women. *Ethnicity & disease*. Fall 2002;12(4):S3-62-71.
175. Samuel-Hodge CD, Johnson CM, Braxton DF, Lackey M. Effectiveness of Diabetes Prevention Program translations among African Americans. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Oct 2014;15 Suppl 4:107-124.
176. Lemacks J, Wells BA, Ilich JZ, Ralston PA. Interventions for improving nutrition and physical activity behaviors in adult african american populations: a systematic review, january 2000 through december 2011. *Preventing chronic disease*. 2013;10:E99.
177. Martinez-Gonzalez MA, Garcia-Arellano A, Toledo E, et al. A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. *PloS one*. 2012;7(8):e43134.
178. Resnicow K, Baranowski T, Ahluwalia JS, Braithwaite RL. Cultural sensitivity in public health: defined and demystified. *Ethnicity & disease*. Winter 1999;9(1):10-21.
179. Whitt-Glover MC, Keith NR, Ceaser TG, Virgil K, Ledford L, Hasson RE. A systematic review of physical activity interventions among African American adults: evidence from 2009 to 2013. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Oct 2014;15 Suppl 4:125-145.
180. Wadden TA, Butryn ML, Byrne KJ. Efficacy of Lifestyle Modification for Long-Term Weight Control. *Obesity research*. 2004;12(S12):151S-162S.



181. Hollis JF, Gullion CM, Stevens VJ, et al. Weight loss during the intensive intervention phase of the weight-loss maintenance trial. *American journal of preventive medicine*. Aug 2008;35(2):118-126.
182. Whitt-Glover MC, Kumanyika SK. Systematic review of interventions to increase physical activity and physical fitness in African-Americans. *American journal of health promotion : AJHP*. Jul-Aug 2009;23(6):S33-56.
183. Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. *BMC medicine*. 2010;8(1):18.
184. Woods-Giscombe CL, Gaylord SA. The Cultural Relevance of Mindfulness Meditation as a Health Intervention for African Americans: Implications for Reducing Stress-Related Health Disparities. *Journal of holistic nursing : official journal of the American Holistic Nurses' Association*. Jan 17 2014;32(3):147-160.
185. Woods-Giscombe CL, Lobel M, Zimmer C, Wiley Cene C, Corbie-Smith G. Whose Stress is Making Me Sick? Network-stress and Emotional Distress in African-American Women. *Issues in mental health nursing*. Sep 2015;36(9):710-717.
186. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA : the journal of the American Medical Association*. Jan 20 2010;303(3):235-241.
187. Woods-Giscombe CL, Lobel M, Zimmer C. OBESITY IN AFRICAN AMERICAN WOMEN: USING STRUCTURAL EQUATION MODELING TO EXAMINE THE CONTRIBUTION OF MULTIDimensionALLY-DEFINED STRESS, SUPERWOMAN SCHEMA-EMOTIONAL SUPPRESSION, AND THE USE OF FOOD TO COPE. Paper presented at: ANNALS OF BEHAVIORAL MEDICINE2012.
188. Cox TL, Zunker C, Wingo BC, Jefferson WK, Ard JD. Stressful life events and behavior change: A qualitative examination of African American women's participation in a weight loss program. *Qualitative Report*. 2011;16(3):622-634.
189. Jones JD, Tucker CM, Herman KC. Stress and nutrition among African American women with hypertension. *American journal of health behavior*. Nov-Dec 2009;33(6):661-672.
190. Strickland OL, Giger JN, Nelson MA, Davis CM. The relationships among stress, coping, social support, and weight class in premenopausal African American women at risk for coronary heart disease. *The Journal of cardiovascular nursing*. Jul-Aug 2007;22(4):272-278.

191. Starkey AJ, Keane CR, Terry MA, Marx JH, Ricci EM. Financial Distress and Depressive Symptoms among African American Women: Identifying Financial Priorities and Needs and why it Matters for Mental Health. *Journal of urban health : bulletin of the New York Academy of Medicine*. Aug 29 2012.
192. Halladay JR, Donahue KE, Hinderliter AL, et al. The Heart Healthy Lenoir project--an intervention to reduce disparities in hypertension control: study protocol. *BMC health services research*. 2013;13:441.
193. Jilcott Pitts SB, Smith TW, Thayer LM, et al. Addressing rural health disparities through policy change in the stroke belt. *Journal of public health management and practice : JPHMP*. Nov-Dec 2013;19(6):503-510.
194. Radloff LS. The CES-D scale a self-report depression scale for research in the general population. *Applied psychological measurement*. 1977;1(3):385-401.
195. Rozario PA, Menon N. An examination of the measurement adequacy of the CES-D among African American women family caregivers. *Psychiatry research*. 2010;179(1):107-112.
196. Levenstein S, Prantera C, Varvo V, et al. Development of the Perceived Stress Questionnaire: a new tool for psychosomatic research. *Journal of psychosomatic research*. Jan 1993;37(1):19-32.
197. Woods-Giscombé CL, & Lobel Gender-related Stress Events Scale (GRSS) & Generic Stress Scale (GSS). Stony Brook University; 2005.
198. Samuel-Hodge CD, Skelly AH, Headen S, Carter-Edwards L. Familial roles of older African-American women with type 2 diabetes: testing of a new multiple caregiving measure. *Ethnicity & disease*. Summer 2005;15(3):436-443.
199. Thomas AJ, Witherspoon KM, Speight SL. Toward the development of the stereotypic roles for Black women scale. *Journal of Black Psychology*. 2004;30(3):426-442.
200. Hood MM, Grupski AE, Hall BJ, Ivan I, Corsica J. Factor Structure and Predictive Utility of the Binge Eating Scale in Bariatric Surgery Candidates. *Surgery for Obesity and Related Diseases*. 2012.
201. Freitas SR, Lopes CS, Appolinario JC, Coutinho W. The assessment of binge eating disorder in obese women: a comparison of the binge eating scale with the structured clinical interview for the DSM-IV. *Eating behaviors*. 2006;7(3):282-289.

202. Allison KC, Lundgren JD, O'Reardon JP, et al. The Night Eating Questionnaire (NEQ): psychometric properties of a measure of severity of the Night Eating Syndrome. *Eating behaviors*. Jan 2008;9(1):62-72.
203. Allison KC, Wrotniak BH, Paré E, Sarwer DB. Psychosocial Characteristics and Gestational Weight Change among Overweight, African American Pregnant Women. *Obstetrics and gynecology international*. 2012;2012.
204. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Preventive medicine*. 1987;16(6):825-836.
205. Young DR, Stewart KJ. A church-based physical activity intervention for African American women. *Family & community health*. Apr-Jun 2006;29(2):103-117.
206. Peterson JA. Evaluation of the Heart and Soul Physical Activity Program by African American women. *The ABNF journal : official journal of the Association of Black Nursing Faculty in Higher Education, Inc.* Summer 2011;22(3):64-72.
207. Parra-Medina D, Wilcox S, Wilson DK, Addy CL, Felton G, Poston MB. Heart Healthy and Ethnically Relevant (HHER) Lifestyle trial for improving diet and physical activity in underserved African American women. *Contemporary clinical trials*. 2010;31(1):92-104.
208. Peterson JA, Cheng A-L. Heart and soul physical activity program for African American women. *Western journal of nursing research*. 2011;33(5):652-670.
209. Connor Gorber S, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Jul 2007;8(4):307-326.
210. Diggins A, Woods-Giscombe C, Waters S. The association of perceived stress, contextualized stress, and emotional eating with body mass index in college-aged Black women. *Eating behaviors*. Dec 2015;19:188-192.
211. Kretsch MJ, Fong AK, Green MW. Behavioral and body size correlates of energy intake underreporting by obese and normal-weight women. *Journal of the American Dietetic Association*. Mar 1999;99(3):300-306; quiz 307-308.
212. Marques L, Alegria M, Becker AE, et al. Comparative prevalence, correlates of impairment, and service utilization for eating disorders across US ethnic groups:

- Implications for reducing ethnic disparities in health care access for eating disorders. *The International journal of eating disorders*. Jul 2011;44(5):412-420.
213. Segrin C, Passalacqua SA. Functions of loneliness, social support, health behaviors, and stress in association with poor health. *Health communication*. Jun 2010;25(4):312-322.
  214. Kegler MC, Swan DW, Alcantara I, Wrensford L, Glanz K. Environmental influences on physical activity in rural adults: the relative contributions of home, church and work settings. *Journal of physical activity & health*. Sep 2012;9(7):996-1003.
  215. Kegler MC, Swan DW, Alcantara I, Feldman L, Glanz K. The influence of rural home and neighborhood environments on healthy eating, physical activity, and weight. *Prevention science : the official journal of the Society for Prevention Research*. Feb 2014;15(1):1-11.
  216. Walker SN, Pullen CH, Hertzog M, Boeckner L, Hageman PA. Determinants of older rural women's activity and eating. *Western journal of nursing research*. Jun 2006;28(4):449-468; discussion 469-474.
  217. Wolfe WA. A review: maximizing social support--a neglected strategy for improving weight management with African-American women. *Ethnicity & disease*. Spring 2004;14(2):212-218.
  218. Finkelstein EA, DiBonaventura M, Burgess SM, Hale BC. The costs of obesity in the workplace. *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine*. Oct 2010;52(10):971-976.
  219. Preiss K, Brennan L, Clarke D. A systematic review of variables associated with the relationship between obesity and depression. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Nov 2013;14(11):906-918.
  220. Tomiyama AJ. Weight stigma is stressful. A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. *Appetite*. Nov 2014;82:8-15.
  221. Gross J, Vancampfort D, Stubbs B, Gorczynski P, Soundy A. A narrative synthesis investigating the use and value of social support to promote physical activity among individuals with schizophrenia. *Disability and rehabilitation*. Jan 2016;38(2):123-150.
  222. Camolas J, Ferreira A, Mannucci E, et al. Assessing quality of life in severe obesity: development and psychometric properties of the ORWELL-R. *Eating and weight disorders : EWD*. Oct 1 2015.

223. Warkentin LM, Das D, Majumdar SR, Johnson JA, Padwal RS. The effect of weight loss on health-related quality of life: systematic review and meta-analysis of randomized trials. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Mar 2014;15(3):169-182.
224. Somerville R, McKenzie K, Eslami S, Breen C, O'Shea D, Wall P. Poor mental health in severely obese patients is not explained by the presence of comorbidities. *Clinical obesity*. Dec 22 2014.
225. Correia de Faria Santarem G, de Cleve R, Santo MA, et al. Correlation between Body Composition and Walking Capacity in Severe Obesity. *PloS one*. 2015;10(6):e0130268.
226. Ernst FA. Speaking of Health: Assessing Health Communication, Strategies for Diverse Populations. *Journal of the National Medical Association*. 2005;97(6):846.
227. Tudor-Locke C, Burkett L, Reis JP, Ainsworth BE, Macera CA, Wilson DK. How many days of pedometer monitoring predict weekly physical activity in adults? *Preventive medicine*. Mar 2005;40(3):293-298.
228. Ammerman AS, Haines PS, DeVellis RF, et al. A brief dietary assessment to guide cholesterol reduction in low-income individuals: design and validation. *Journal of the American Dietetic Association*. Nov 1991;91(11):1385-1390.
229. Jilcott SB, Keyserling TC, Samuel-Hodge CD, Johnston LF, Gross MD, Ammerman AS. Validation of a brief dietary assessment to guide counseling for cardiovascular disease risk reduction in an underserved population. *Journal of the American Dietetic Association*. Feb 2007;107(2):246-255.
230. Keyserling TC, Samuel Hodge CD, Jilcott SB, et al. Randomized trial of a clinic-based, community-supported, lifestyle intervention to improve physical activity and diet: the North Carolina enhanced WISEWOMAN project. *Preventive medicine*. Jun 2008;46(6):499-510.
231. Giles-Corti B, Timperio A, Cutt H, et al. Development of a reliable measure of walking within and outside the local neighborhood: RESIDE's Neighborhood Physical Activity Questionnaire. *Preventive medicine*. Jun 2006;42(6):455-459.
232. Jones SA, Evenson KR, Johnston LF, et al. Psychometric properties of the modified RESIDE physical activity questionnaire among low-income overweight women. *Journal of science and medicine in sport / Sports Medicine Australia*. Jan 2015;18(1):37-42.

233. McHorney CA, Ware JE, Jr., Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Medical care*. Mar 1993;31(3):247-263.
234. Ware J, Jr., Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical care*. Mar 1996;34(3):220-233.
235. Larson CO, Schlundt D, Patel K, Beard K, Hargreaves M. Validity of the SF-12 for use in a low-income African American community-based research initiative (REACH 2010). *Preventing chronic disease*. Apr 2008;5(2):A44.
236. Sherbourne CD, Stewart AL. The MOS social support survey. *Social science & medicine (1982)*. 1991;32(6):705-714.
237. El-Sayed AM, Scarborough P, Galea S. Unevenly distributed: a systematic review of the health literature about socioeconomic inequalities in adult obesity in the United Kingdom. *BMC public health*. 2012;12:18.
238. Krueger PM, Reither EN. Mind the Gap: Race/Ethnic and Socioeconomic Disparities in Obesity. *Current diabetes reports*. Nov 2015;15(11):95.
239. Boggs DA, Palmer JR, Spiegelman D, Stampfer MJ, Adams-Campbell LL, Rosenberg L. Dietary patterns and 14-y weight gain in African American women. *The American journal of clinical nutrition*. Jul 2011;94(1):86-94.
240. Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Aug 2013;14(8):606-619.
241. Harrington S. The role of sugar-sweetened beverage consumption in adolescent obesity: a review of the literature. *The Journal of school nursing : the official publication of the National Association of School Nurses*. Feb 2008;24(1):3-12.
242. Newton RL, Jr., M HH, Dubbert PM, et al. Pedometer determined physical activity tracks in African American adults: the Jackson Heart Study. *The international journal of behavioral nutrition and physical activity*. 2012;9:44.
243. Hornbuckle LM, Bassett DR, Jr., Thompson DL. Pedometer-determined walking and body composition variables in African-American women. *Medicine and science in sports and exercise*. Jun 2005;37(6):1069-1074.

244. Fan JX, Wen M, Kowaleski-Jones L. Rural-urban differences in objective and subjective measures of physical activity: findings from the National Health and Nutrition Examination Survey (NHANES) 2003-2006. *Preventing chronic disease*. 2014;11:E141.
245. O'Neil CE, Nicklas TA, Fulgoni VL, 3rd. Nutrient intake, diet quality, and weight/adiposity parameters in breakfast patterns compared with no breakfast in adults: national health and nutrition examination survey 2001-2008. *Journal of the Academy of Nutrition and Dietetics*. Dec 2014;114(12 Suppl):S27-43.
246. Wilcox S, Sharpe PA, Turner-McGrievy G, Granner M, Baruth M. Frequency of consumption at fast-food restaurants is associated with dietary intake in overweight and obese women recruited from financially disadvantaged neighborhoods. *Nutrition research (New York, N.Y.)*. Aug 2013;33(8):636-646.
247. Hickson DA, Diez Roux AV, Smith AE, et al. Associations of fast food restaurant availability with dietary intake and weight among African Americans in the Jackson Heart Study, 2000-2004. *American journal of public health*. Dec 2011;101 Suppl 1:S301-309.
248. Johnson ER, Carson TL, Affuso O, Hardy CM, Baskin ML. Relationship between social support and body mass index among overweight and obese African American women in the rural deep South, 2011-2013. *Preventing chronic disease*. 2014;11:E224.
249. Ryan DH, Johnson WD, Myers VH, et al. Nonsurgical weight loss for extreme obesity in primary care settings: results of the Louisiana Obese Subjects Study. *Archives of internal medicine*. Jan 25 2010;170(2):146-154.
250. Blackburn GL, Wollner S, Heymsfield SB. Lifestyle interventions for the treatment of class III obesity: a primary target for nutrition medicine in the obesity epidemic. *The American journal of clinical nutrition*. Jan 2010;91(1):289S-292S.
251. Livhits M, Mercado C, Yermilov I, et al. Does weight loss immediately before bariatric surgery improve outcomes: a systematic review. *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery*. Nov-Dec 2009;5(6):713-721.
252. Noar SM, Benac CN, Harris MS. Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychological bulletin*. Jul 2007;133(4):673-693.
253. Samuel-Hodge CD, Johnston LF, Gizlice Z, et al. Randomized trial of a behavioral weight loss intervention for low-income women: the Weight Wise Program. *Obesity (Silver Spring, Md.)*. Oct 2009;17(10):1891-1899.

254. The Diabetes Prevention Program (DPP): description of lifestyle intervention. *Diabetes care*. Dec 2002;25(12):2165-2171.
255. Wing RR, Hamman RF, Bray GA, et al. Achieving weight and activity goals among diabetes prevention program lifestyle participants. *Obesity research*. Sep 2004;12(9):1426-1434.
256. Svetkey LP, Ard JD, Stevens VJ, et al. Predictors of long-term weight loss in adults with modest initial weight loss, by sex and race. *Obesity (Silver Spring, Md.)*. Sep 2012;20(9):1820-1828.
257. UNC Center for Training and Research Translation. <http://www.centertrt.org>.
258. Glasgow RE, Magid DJ, Beck A, Ritzwoller D, Estabrooks PA. Practical clinical trials for translating research to practice: design and measurement recommendations. *Medical care*. Jun 2005;43(6):551-557.
259. Davis M, Robbins-Eshelman E, McKay M. *Relaxation and Stress Reduction Workbook (6th Edition)*. Oakland, CA, USA: New Harbinger Publications; 2008.
260. McKay M, Wood JC, Brantley J. *The dialectical behavior therapy skills workbook: Practical DBT exercises for learning mindfulness, interpersonal effectiveness, emotion regulation & distress tolerance*. ReadHowYouWant. com; 2010.
261. MyFitnessPal. <http://www.myfitnesspal.com>.
262. Launer LJ, Harris T, Rumpel C, Madans J. Body mass index, weight change, and risk of mobility disability in middle-aged and older women. The epidemiologic follow-up study of NHANES I. *JAMA : the journal of the American Medical Association*. Apr 13 1994;271(14):1093-1098.
263. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*. Feb 1991;39(2):142-148.
264. Fitzgibbon ML, Stolley MR, Ganschow P, et al. Results of a faith-based weight loss intervention for black women. *Journal of the National Medical Association*. Oct 2005;97(10):1393-1402.
265. Kumanyika SK, Shults J, Fassbender J, et al. Outpatient weight management in African-Americans: the Healthy Eating and Lifestyle Program (HELP) study. *Preventive medicine*. Aug 2005;41(2):488-502.



266. Rimmer JH, Rauworth A, Wang E, Heckerling PS, Gerber BS. A randomized controlled trial to increase physical activity and reduce obesity in a predominantly African American group of women with mobility disabilities and severe obesity. *Preventive medicine*. May 2009;48(5):473-479.
267. Befort CA, Nollen N, Ellerbeck EF, Sullivan DK, Thomas JL, Ahluwalia JS. Motivational interviewing fails to improve outcomes of a behavioral weight loss program for obese African American women: a pilot randomized trial. *Journal of behavioral medicine*. Oct 2008;31(5):367-377.
268. Davis Martin P, Rhode PC, Dutton GR, Redmann SM, Ryan DH, Brantley PJ. A primary care weight management intervention for low-income African-American women. *Obesity (Silver Spring, Md.)*. Aug 2006;14(8):1412-1420.
269. Moroshko I, Brennan L, O'Brien P. Predictors of dropout in weight loss interventions: a systematic review of the literature. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. Nov 2011;12(11):912-934.
270. Teixeira PJ, Going SB, Houtkooper LB, et al. Pretreatment predictors of attrition and successful weight management in women. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. Sep 2004;28(9):1124-1133.
271. Wilbur J, McDevitt J, Wang E, et al. Recruitment of African American women to a walking program: eligibility, ineligibility, and attrition during screening. *Research in nursing & health*. Jun 2006;29(3):176-189.
272. Johns DJ, Hartmann-Boyce J, Jebb SA, Aveyard P. Diet or exercise interventions vs combined behavioral weight management programs: a systematic review and meta-analysis of direct comparisons. *Journal of the Academy of Nutrition and Dietetics*. Oct 2014;114(10):1557-1568.
273. Black AR, Woods-Giscombe C. Applying the Stress and 'Strength' Hypothesis to Black women's breast cancer screening delays. *Stress and health : journal of the International Society for the Investigation of Stress*. Dec 2012;28(5):389-396.
274. Pitts SB, Vu MB, Garcia BA, et al. A community assessment to inform a multilevel intervention to reduce cardiovascular disease risk and risk disparities in a rural community. *Family & community health*. Apr 2013;36(2):135-146.
275. Allen JK, Stephens J, Patel A. Technology-assisted weight management interventions: systematic review of clinical trials. *Telemedicine journal and e-health : the official journal of the American Telemedicine Association*. Dec 2014;20(12):1103-1120.

- 276. Joseph RP, Ainsworth BE, Keller C, Dodgson JE. Barriers to Physical Activity Among African American Women: An Integrative Review of the Literature. *Women & health*. 2015;55(6):679-699.
- 277. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Preventive medicine*. Nov 1987;16(6):825-836.
- 278. Allison KC, Engel SG, Crosby RD, et al. Evaluation of Diagnostic Criteria for Night Eating Syndrome Using Item Response Theory Analysis. *Eating behaviors*. Dec 2008;9(4):398-407.